



WELDED
Solid Steel Windows

Local Representative

FEDERAL STEEL SASH COMPANY

Waukesha, Wisconsin

FEDERAL STEEL SASH COMPANY

Manufacturers of Electric Arc Welded Solid Section Steel Windows
and Tubular Doors

WAUKESHA, WIS.

CHICAGO OFFICE, 228 No. La Salle Street
DALLAS OFFICE, 607 Thomas Building
INDIANAPOLIS OFFICE, 333 No. Pennsylvania Street

KANSAS CITY OFFICE, 601 Commerce Building
MILWAUKEE OFFICE, 633 No. Water Street
MOLINE OFFICE, State Trust Building

Member Solid Section Steel Window Industry

Experience and Facilities

The FEDERAL STEEL SASH COMPANY has been continuously in business during a period of over nine years in specialized manufacturing and marketing of electric arc welded solid section steel windows and tubular steel doors.

The superiority of the product, due to advanced engineering design and modern methods of manufacture, has met with ready acceptance and the preference of discriminating architects, engineers and builders.

The factory, covering an area of over 100,000 sq. ft. and fully equipped with the most modern machine tools and arc welders, has a capacity in excess of 5,000,000 sq. ft. of windows annually.

Scope of This Catalogue

This catalogue gives complete specification data and details of sizes and design of Federal products. Standard practice of the Department of Commerce, as recommended for the Solid Section Steel Window Industry, has been followed.

That the greatest economy may be effected, consultation



with local representatives is recommended in the selection of types of product best adapted to the particular condition while the plans and specifications are in course of preparation, thus obviating the possible necessity of changes.

Designing and Engineering Service

A thoroughly experienced Designing and Engineering Department is maintained at the home office, which is at all times available to the architects and engineers for the solution of problems involving steel window and door installations.

Erection Service

The company is prepared to contract for the erection and field painting of Federal products where it is desirable to centralize the responsibility for the complete installation. While the erection of Federal products, due to the rigidity and strength resulting from their welded construction, is greatly simplified, the highest economy will be effected only where the field work is handled by specially trained and thoroughly experienced erectors.

INDEX

	PAGE	PLATE		PAGE	PLATE
Outstanding Federal Features			Types and Sizes	14	B1
Electric Arc Welded Construction.....	2	.....	Typical Details	15	B2
Materials	2	.....			
Federal Manufacturing Methods.....	3	.....	Continuous Top Hung Windows		
Double Contact of Window Ventilators.....	3	.....	Specifications	16	.....
No Corrosion at Joints.....	3	.....	Typical Details	17	C1
Rust Prevention	3	.....			
Federal Close Pivot.....	3	.....	Mechanical Operating Devices		
Federal Draw Tight Push Bar.....	3	.....	General	18	.....
Federal Commercial and Architectural Pro-			Description	18	.....
jected Window Bronze Friction Guide..	3	.....	Specifications	19	.....
			Mechanical Operators A, B	20	D1-D3
Window Information			Mechanical Operator A	21	D2
Window Designations	4	.....	Mechanical Operator C	22	D4
Window and Door Dimensions.....	4	.....			
Prepared Openings	4	.....	Architectural Projected Windows		
Glazing and Putty	4	.....	Specifications	23	.....
Standards	4	.....	Types and Sizes.....	24	E1
			Typical Details	25	E2
Pivoted Windows					
Specifications	5	.....	Swing and Slide Steel Doors		
Types and Sizes	6	A1-A2	Specifications	26	.....
Curved Heads—Horizontal Mullions.....	7	A3	Types and Sizes.....	27	F1
Typical Details	8	A4	Typical Details	28	F2
Hardware	9	A5	Hardware	29	F3
Underwriters' Labeled Windows.....	10	A6			
Symmetrical Combinations	11	A7	Airplane Hangar Doors		
Installation Details—Prepared Openings....	12	A8	Specifications	30	.....
			Details	31	F4
Commercial Projected Windows			Details	32	F5
Specifications	13	.....			

OUTSTANDING FEDERAL FEATURES

Electric Arc Welded Construction

While the discussion below applies more particularly to the horizontally pivoted window, the same underlying features of design and construction hold good in all Federal products.

When steel windows were first introduced, the designers were faced with the problem of making a joint between the various members, similar to the joints in wood sash, which could be economically produced with the facilities then available. Some form of interlocked, mitered, dovetailed or tongue and slot joint was used, in which it was necessary to cut away a portion of the section of each of the members to be joined. As a result, the actual or effective depth of the mechanically jointed section was less at the joint by the amount of the cutout than the overall depth, and as the strength at the weakest point had to be sufficient to withstand the stresses to which the window would be subjected, the members as designed were of necessity heavier between the joints than was required, with the result that extra weight was added to the member without adding anything to the strength or stiffness of the window. This is the old proposition of the chain and its weak link.

Just as no chain is stronger than its weakest link, no window member is stronger than its weakest point.

In addition to the disadvantage of having to increase the weight of the members without any compensating increase in strength or stiffness, there was a further pronounced disadvantage inherent in interlocked, mitered, dovetailed or tongue and slot joints, namely, that after the window was assembled it would rack out of shape in handling, shipping and erecting. This instability of construction arose from the fact that the only way in which these joints could be held in place was by hammering or pressing the members together.

The inability to make a rigid mechanical joint not only increases the difficulty and cost of erection, but what is more important — makes difficult a properly weathered and easily operating ventilator.

It was not until the development of electric arc welding as a manufacturing process that a method of making connections was available which would eliminate the excess weight and the

instability inherent in mechanically formed joints. The use of the electric arc is today so general in industry and construction as to require no argument to prove its practicability.

Federal engineers, in designing Federal Electric Arc Welded Products, were enabled to take advantage of this most modern method of joining materials and to design a window with sections and joints in which the gross section of the member is utilized to the full for strength and stiffness, in which all excess weight is eliminated and in which every joint and connection is absolutely rigid and stable, a window which it is not possible to rack or distort in handling, shipping and erection.

There is in the minds of some the impression that because something is heavy it must be inherently strong. This impression is, of course, to anyone acquainted with engineering principles, absurd, as it is well recognized that **mere weight does not in itself mean strength**, but that it is the proper distribution of the metal in the section and the proper design of the section itself for the purpose for which it is intended that are the essential factors. It is evident that any metal used in excess of that required to pro-

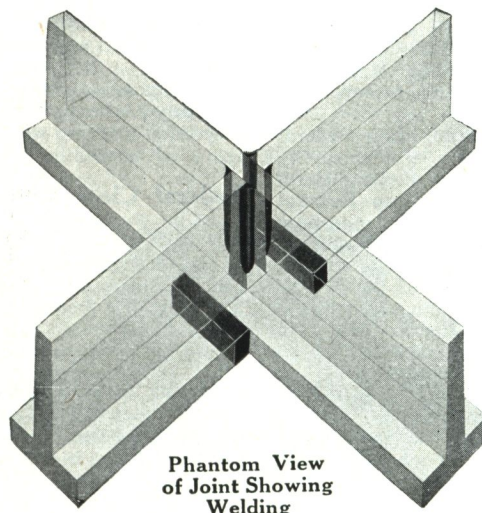
duce the given result can add no useful strength and is to all intents and purposes merely excess weight.

In order to visualize the relation between the weight per foot and the strength of the muntin section used in horizontally pivoted windows as determined by the condition at the joint after fabrication, the chart shown herewith has been prepared. **It will be evident from an examination of this chart that the Federal muntin section, while the lightest section in weight per foot, is also the strongest.** A study of this chart together with an examination of the types of construction used on competitive windows will demonstrate that Federal engineers have been able to utilize material to its full value, and why the claim of superiority of design and construction for Federal products

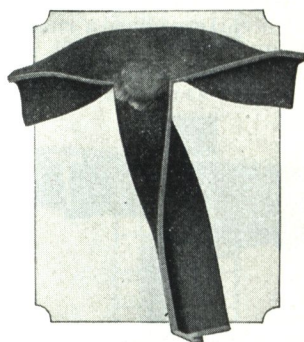
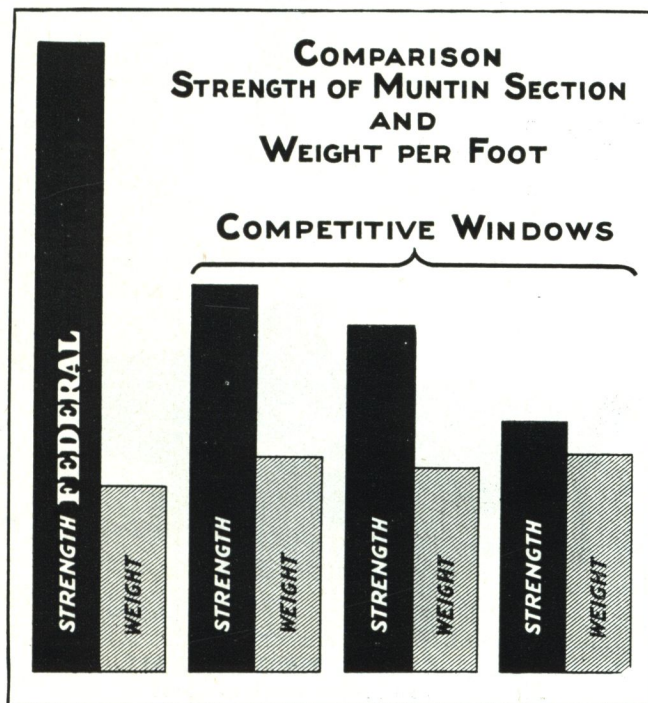
over the design and construction of any competitive window is well founded.

Materials

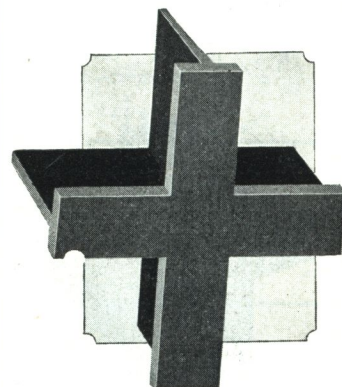
All sections are open hearth solid steel, hot rolled or cold drawn, of special Federal design.



Phantom View
of Joint Showing
Welding



Distorted Joint, Showing
the Remarkable Strength
of the Weld



The Muntin Joint
Note the Smooth Exterior
Surface

Federal Manufacturing Methods

The raw material is cut to length and the ends formed for the welded connection in one operation. Where members are built up of two or more sections they are **electric spot welded** together while firmly held in jigs to assure accurate dimensions of the built-up members.

Preparatory to electric arc welding the joints, the individual members are assembled on welding tables. These tables consist of rigid heavy structural steel frames with accurately machined surfaces. On these frames are bolted the welding pads with their clamps and guides. The individual members are clamped in the guides with their exterior faces against the welding pads and while thus firmly held in position each connection is **electric arc welded**. This method insures absolute squareness and accuracy of dimension and a product which is to all intent and purpose one solid piece. The design of the welding tables, and the method of assembling and welding on the tables, are protected by United States patents Nos. 1648409 and 1648416.

A comparison of methods used in manufacturing Federal Windows with those used in the manufacture of competitive windows will show several points of superiority in the Federal method. **There are no cutouts or notches in any Federal members** to permit of the joining together of two members at the joint, and **there is no distortion, spreading or stretching of the material in Federal construction**, as is the case in a number of other makes of windows. The use of the electric arc for forming connections fills up all spaces between members and leaves **a smooth, unbroken surface at the Federal connection** as compared to the overlapped surface or butted edges common to connections in competitive windows.

After welding, the products are removed from the welding table and the face of each weld is ground to a smooth surface. All excess material and roughness at the welds on the interior is removed by chipping with an air hammer. This operation not only cleans each weld, but subjects each individual weld to a severe shock test, so that in this operation **every weld made on Federal products is individually tested for strength**.

Ventilators are then fitted and hardware attached, after which the product is again inspected, is painted and is then ready for shipment.

Double Contact Weathering of Window Ventilators

Federal window ventilators are constructed to provide **continuous double contact weathering** around all four sides of the ventilators. All ventilators are accurately fitted at the shop, and since Federal windows are rigid and cannot be distorted in handling, shipment or erection, the window when erected will be in a satisfactory weathering condition.

The shop fitting of Federal horizontally pivoted ventilators, combined with the Federal close pivot construction and the lever action of Federal draw-tight ventilator operators, produces a pivoted window which is both rain and wind tight.

Tests which have been made by reputable engineers in a careful and scientific manner to determine the leakage through ventilators on horizontally pivoted steel windows demonstrate the superiority of Federal construction over that used in competitive windows. Comparing the result of tests on five other windows to the result on Federal, the nearest competitive

window had a leakage of 39.5% in excess of Federal, while the maximum leakage was 143.0% of Federal, and the average for the five windows was 105.8% in excess of Federal, or over twice the leakage through the Federal ventilator.

No Corrosion of Joints

There are no overlapped surfaces or butt contacts on Federal steel windows, and consequently there are no points at which moisture can enter and set up corrosion. The flush exterior surface of Federal windows, free from all projections and ledges, avoids the collection of dirt and moisture. **There are no open joints**. All surfaces are accessible for painting.

Rust Prevention

As Federal windows are absolutely rigid and there are no open, overlapped or butt joints, and all surfaces are smooth and accessible, it is possible to **hot dip galvanize** Federal windows or to **plate with any protective metal covering** with the assurance that the protective covering will not be injured due to movement between the window members while being handled, shipped or erected.

Federal Close Pivot

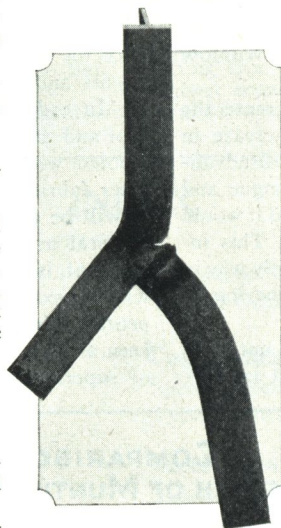
The Federal pivot for horizontally pivoted windows projects but $\frac{5}{8}$ in. from the window frame. It consists of two substantial pressed steel leaves joined with a sturdy bronze pin. The use of a bronze pin prevents rusting and insures at all times a free acting ventilator. The very small projection of this pivot materially lessens the chance of injury during shipment, handling and erecting.

Federal Draw-Tight Push Bars

The horizontally pivoted ventilator push bar is attached to the bottom of the ventilator at one side of the center with a **heavy pressed metal hinge**, which gives a universal joint to the bar. When the ventilator is closed the push bar folds back, parallel to the face of the window, against a strike plate which is bolted to the fixed portion of the window at the center. At the side of the ventilator opposite the hinge is a locking clip bolted to the ventilator. The hinge, strike plate and locking clip are so located that when the push bar is in its locking position, the bar presses against the center strike plate, thus drawing the ventilator into tight weathering contact and at the same time locking it against opening.

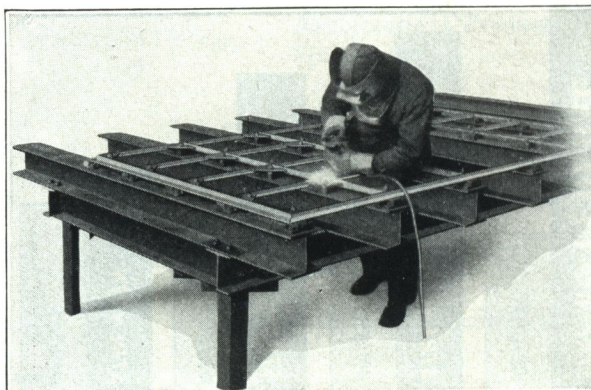
Federal Commercial and Architectural Projected Window Bronze Friction Guides

As the smooth operation of projected ventilators depends upon the friction guide, the proper design of this feature is of importance. The Federal bronze friction guide is designed to eliminate the scraping action of the ordinary bronze shoe used on competitive windows. A guide angle is provided on each jamb of the ventilator opening, which serves to hold the ventilator in its proper location at any degree of opening. **A bronze yoke, which has a hardened steel ball**, slides on this guide angle. The friction which holds the ventilator in any desired position is obtained by the pressure of a spring in the friction guide forcing the steel ball against the edge of the guide angle. In this way rubbing or scraping of the friction guide against the sides of the ventilator opening is eliminated and a smooth and positive acting ventilator adjustment is obtained.

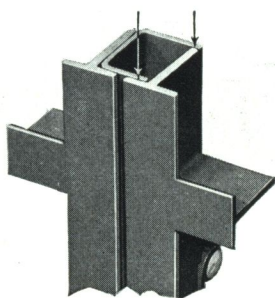


The Weld Produces a Joint as Strong as the Section

Note failure of the section, the weld being intact



Specially Designed Welding Tables Insure Accurate Dimensions and Absolute Squareness



Double Contact Weathering All Four Sides of the Ventilators



Pressed Steel Hinge with Brass Pin

WINDOW INFORMATION

Window Designations

Horizontally Pivoted and Commercial Projected Windows are designated by a series of numbers—these designations being standard in the industry. The first digit is the number of lights in width, the second, the number of lights in height, and the following digits indicate the number of ventilators, the number of panes in each ventilator and the location of each ventilator with reference to the sill of the window. Thus, a window four lights wide and five lights high, with one eight light ventilator located one light up from the sill, will be designated as a 45181. Similarly, a window five lights wide and seven lights high, with two six light ventilators, one located one light up from the sill and the second located four lights up from the sill, will be designated as a 572614. See Plates A1, A2 and B1.

Architectural Projected Windows are designated by numbers which indicate the width and the height of the unit, but do not indicate the arrangement of the ventilators. Thus, an architectural projected window 3 ft. 0 in. in width by 8 ft. 6 in. in height would be designated as 3086. See Plate E1.

Continuous Windows, Operators and Industrial and Airplane Hangar Doors do not have standard designation.

Graphic designations of window ventilators and of industrial doors, standard in the industry, are shown on the various plates.

Window and Door Dimensions

Windows, except continuous windows, and industrial doors have dimensions which are standard to the industry. The window and door dimensions are the clear opening measurements and are not the overall or out to out dimensions of the unit.

Dimensions for continuous windows are special to each installation.

Prepared Openings

The best practice consists in preparing the openings so that windows may be erected after the walls are up. Clearance must be provided in accordance with the installation details shown on the Plates. Windows are not designed as structural members and are not intended to be subjected to loads resulting from settlement of the building. Window manufacturers do not undertake the preparation of openings as a part of the work of installing windows. See Plate A8.

Glazing and Putty

Glass Sizes for horizontally pivoted and commercial projected windows are two standard sizes—12/18 and 14/20. Sizes of the panes in the ventilators differ from those in the fixed portions of the window. Glass sizes for all panes are shown on Plate A7. Panes for curved heads are of special size and must be cut to fit in the field.

Glass sizes for architectural projected windows are shown on Plate E1.

Glass sizes for continuous windows are special and cannot be determined until after approval of the window design.

Glass sizes for window portions of both industrial and airplane hangar doors are, generally speaking, special and must be cut to meet each individual case.

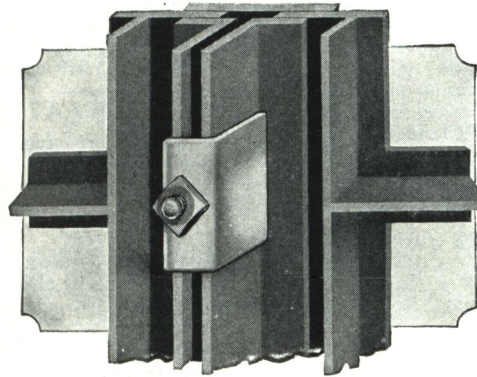
Glazing—Horizontally pivoted and commercial projected windows use copper coated spring wire glazing clips, which are furnished by the window manufacturer, except for underwriters' labeled and glazing angle windows, which have continuous glazing angles bolted to the window members.

Continuous windows use short glazing angles bolted to the window muntins.

Architectural projected windows use continuous glazing angles bolted to the window members, unless specified for spring wire clip glazing. It is not advisable to glaze ventilator panes in architectural projected windows with spring wire glazing clips, as the size of the pane and the weight of the glass makes this method unsafe.

Window portions of doors are glazed with continuous glazing angles in the same manner as underwriters' labeled and glazing angle windows.

Putty—Steel windows must be glazed with litharge or standard glazier's putty. Ordinary commercial putty, as used on wood sash, must never be used in glazing steel windows.



Adjustable Mullion

Standards

Certain types of horizontally pivoted windows are carried in stock at factory and warehouses. These are shown as solid line tinted units on Plate A1-A2. Units shown as solid line but without tinting are shipped from factory only. Listed special types, shown as dotted line, are not carried in stock. Curved head windows shown on Plate A3 are not carried in stock.

Commercial projected windows, standard and listed special types, are shown on Plate B1. They are not carried in stock. Continuous windows are made to meet the requirements of each individual structure and are not carried in stock.

Architectural projected windows, standard and listed special sizes shown on Plate E1, are not carried in stock.

Industrial doors, standard and listed special sizes shown on Plate F1, are not carried in stock.

Airplane hangar doors are not carried in stock.

Underwriters' Labeled Windows—Horizontally pivoted and commercial projected windows can be furnished with Underwriters' Laboratories, Inc., label, within the limitations for such windows imposed by the laboratories. Continuous windows, architectural projected windows and industrial and airplane hangar doors cannot be furnished with underwriters' label. See Plate A6.

SYMBOL DESIGNATION	
NOTE: THE POINT INDICATES THE PIVOT OR HINGE IN ALL CASES	
 HORIZONTALLY PIVOTED	 TOP PIVOTED
 BOTTOM HINGED	 PROJECT OUT
 PROJECTED WINDOWS	 PROJECT IN
SWING DOORS LEFT HAND—OPEN IN LEFT HAND—OPEN OUT RIGHT HAND—OPEN IN RIGHT HAND—OPEN OUT	
SLIDE DOORS LEFT HAND SLIDE L RIGHT HAND SLIDE R	
DOOR SYMBOLS HINGED SIDE DIRECTION OF SWING DIRECTION OF SLIDE	

(A) PIVOTED WINDOWS—Specifications

Note: Notes are explanatory or advisory only and should not be included in the specifications.

(A1) Work Included

Note: List and locate all pivoted windows either in schedules on plans or here to assure accuracy in estimates.

(A2) General

Pivoted windows shall be Federal electric arc welded windows, manufactured by FEDERAL STEEL SASH COMPANY, Waukesha, Wisconsin, or equivalent, meeting fully this company's standard of quality.

(A3) Shop Drawings

Furnish in (duplicate) (triplicate) for approval of the architect, complete shop drawings of all work, showing accurately all details of location, hardware and installation.

(A4) Materials

(A4a) Sections—All sections shall be open hearth solid steel, hot rolled or cold drawn, of special Federal design. Frame and muntin sections shall be 1½ in. in depth.

(A4b) Vertical Mullions—Vertical mullions shall consist of an exterior plate, two interior angles, cadmium plated U-clips and bolts. For windows 7 lights high and over, mullions shall consist of an exterior plate, two interior channels, clips and bolts.

(A4c) Horizontal Mullions—Horizontal mullions shall be FEDERAL STEEL SASH COMPANY standard.

Note: See Plate A3.

Note: Horizontal mullions should be furnished under structural steel specifications.

(A5) Construction

(A5a) Fabrication—All joints and connections shall be full electric arc welded.

(A5b) Frames—Frame members shall be continuous from head to sill and jamb to jamb, mitered at corners and electric arc welded.

(A5c) Muntins—Horizontal muntin bars shall be continuous from jamb to jamb. Vertical muntins shall be cut to fit horizontal muntins and frames and electric arc welded thereto.

(A5d) Weathering—Ventilators shall have double contact weathering continuous around all four sides.

(A5e) Vertical Mullions—Where two or more windows are placed side by side in the same opening, provide Federal universal adjustable vertical mullions. All mullions shall extend 2 in. into sills for anchorage.

(A5f) Horizontal Mullions—Where two or more windows are placed one above another in the same opening, provide Federal standard horizontal mullions. In mullions provide at least 4-in. bearing at each end and in structural steel openings arrange for proper attachment.

(A5g) Clips—Furnish all necessary clips and bolts for attaching windows to structural steel.

Note: Include in steel specifications all punching to accommodate clips.

(A5h) Masonry Anchors—Furnish where called for: masonry anchors and bolts for attachment.

(A6) Hardware

Note: All hardware on pivoted windows is attached at factory. Specify type required. See illustration Plate A5.

(A6a) Horizontally Pivoted Ventilators shall be pivoted 2 in. above center line on heavy pressed metal, close knuckle, steel hinges with bronze pins. Hinges shall be bolted and locked through ventilator and frame members.

(A6b) Top Pivoted Ventilators—Pivoted 4 in. down from the head of the ventilator to swing out, shall be furnished where called for on plans. The same pivot shall be used as for horizontally pivoted ventilators.

(A6c) Bottom Hinged Swing In Ventilators—Furnish where called for on plans; bottom hinged ventilators to swing in. Each bottom hinged ventilator shall be provided with two slotted steel stay arms to permit opening to approximately 45°. Two heavy pressed metal butt hinges with bronze pin shall be attached to each ventilator. Leaves shall be electric arc welded to both ventilator and frame, except where windows are hot galvanized or rust proofed, when they shall be bolted. Provide each ventilator with spring catch and pole ring attached at head.

(A6d) Push Bars—Provide notched steel angle push bars so attached to a pressed steel hinge bolted off center to the ventilator bottom rail as to give free universal movement. Provide a pressed steel strike plate bolted to fixed portion of window and pressed steel locking clip on ventilator.

Note: Use only for manual operation within reach.

(A6e) Cam Latches, Rollers and Chain—Provide malleable iron cam latches with bronze pin bolted at center of ventilator bottom rail; cadmium plated steel roller, bolted to center of ventilator head; chain fastener (No. 106) (No. 107); and sufficient endless galvanized steel chain for operation.

Note: Use No. 106 chain fastener (attached to window) where sill is not more than 6 ft. from floor; No. 107 (attached to wall) where sill is over 6 ft. from floor.

(A6f) Spring Catches—Provide steel spring catches with bronze tongues and pole rings and pressed steel keepers bolted at center of ventilator head and frame. Provide sufficient galvanized steel chain for operation.

Note: Use where adapted in lieu of push bar or cam latch and roller.

(A6g) Underwriters Labeled Windows—Where called for on plans furnish windows to Underwriters' Laboratories, Inc., requirements. Each underwriters' window shall have attached Underwriters' Laboratories label.

Note: See (A12) page 10.

(A7) Mechanical Operators

Note: Specifications for mechanical operators are given on Federal Page 19. Where specified, provision is made at shop for attaching operator arm to ventilator.

(A8) Painting

(A8a) All windows shall be given one dip-coat of gray mineral paint by the manufacturer before shipment.

Note: Provide for the following in the painting specification: One field coat of paint should be applied after erection before glazing. The application of one or more additional coats should be deferred until at least three weeks after glazing to allow putty to set.

(A8b) After erection and before glazing, all windows shall be given one coat of paint in the field. Paint shall be (specify).

Note: Where windows are erected by FEDERAL STEEL SASH COMPANY, it will do field painting where specified. (See Page 1.)

(A9) Hot Galvanizing or Rust Proofing

Note: See page 3.

All windows shall be (hot dip galvanized) (cadmium plated) (other rust proof coated) after fabrication.

Note: Do not paint for at least one year.

(A10) Erection

Note: Include in masonry specifications that all masonry openings shall be accurately prepared in accordance with Federal installation details. (See Page 4.)

Note: Include in masonry specifications that all mortar grouting, mastic, pointing, etc., shall be done by the masonry contractor after windows have been erected.

(A10a) All windows shall be erected by FEDERAL STEEL SASH COMPANY in openings prepared by others.

Note: See Page 1.

(A10b) All windows shall be set plumb and true in perfect alignment and securely anchored before glazing.

(A10c) Apply all unattached hardware in accordance with the manufacturer's directions.

(A11) Glass and Glazing

Note: Include the following in the Glazing Specifications.

Note: See Page 4.

(A11a) Glass—Glass shall be (¼ in. rough wire) (¼ in. factory ribbed) (½ in. factory ribbed) (double strength grade A) (double strength grade B).

(A11b) Putty—Putty shall be high grade steel window putty.

Note: See Page 4.

(A11c) Glazing—All horizontally pivoted (top pivoted or bottom hinged) windows shall be glazed from the inside. Bed all glass in putty and secure with steel spring wire glazing clips furnished by window manufacturer. Face putty shall be applied in a neat, smooth manner.

Note: Do not paint until putty has set—see Plate A8.

WAREHOUSE STOCK UNITS ARE TINTED

12x18 GLASS	2-15	3-2	3-2	3-2	4-23	4-23	4-23	5-23	5-23	6-03	6-03	6-03	7-36
14x20 GLASS	2-58	3-8	3-8	3-8	4-108	4-108	4-108	5-23	5-23	6-03	6-03	6-03	7-36
3-15													
4-8													
5-2													
6-23													
7-03													
8-62													
9-36													
10-36													
10-92													
11-112													
12x18													
14x20													
32	32160	42	42140	42180	52	52160	62180						
33	33161	43	43141	43181	53	53161	63181						
34	34161	44	44141	44181	54	54161	64181						
35	35161	35162	45	45141	45181	45182	55	55161	55162	65181			
36	36161	362614	46	46141	46181	462814	56	56161	562614				
		372614	47			472814				572614			

LISTED SPECIAL TYPES

[illegible]

FEDERAL
September 1930

HORIZONTALLY PIVOTED WINDOWS

Types and Sizes

PLATE No.
A1—A2

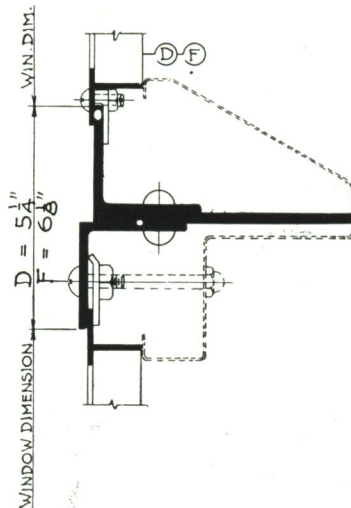
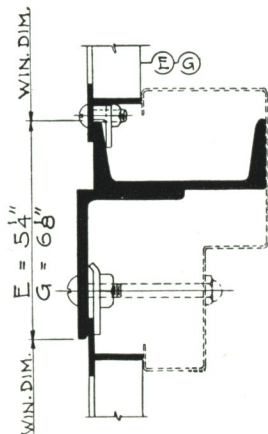
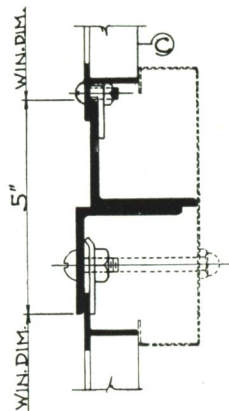
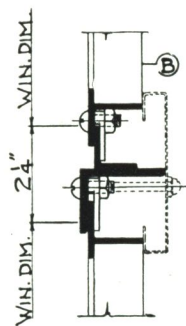
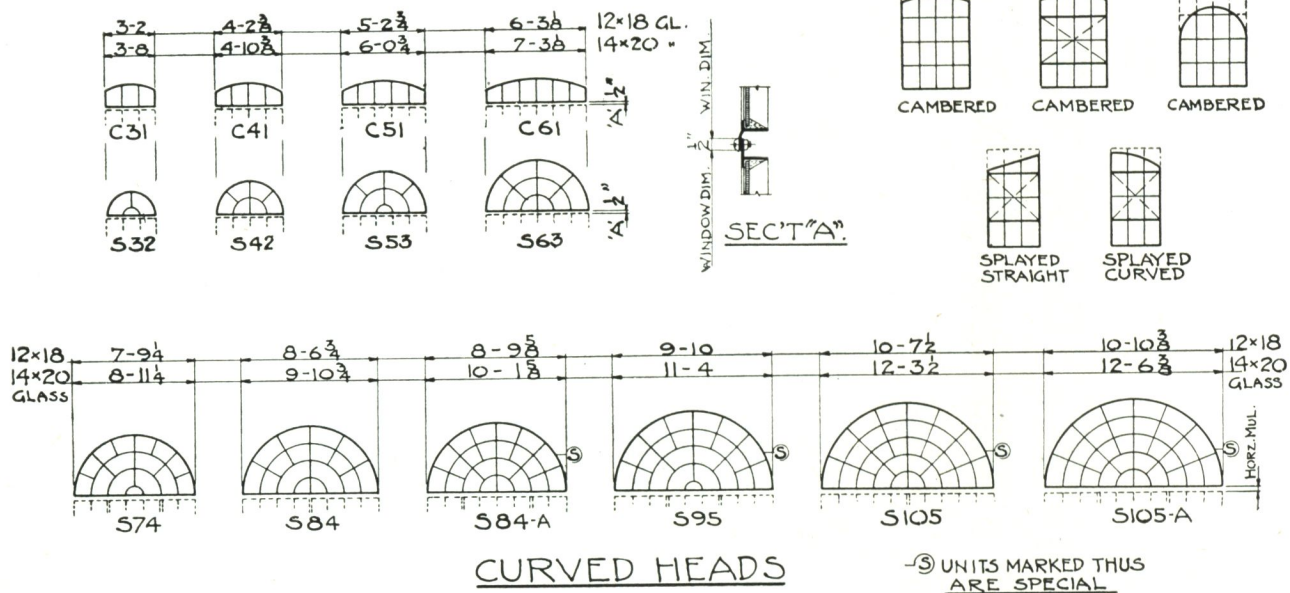
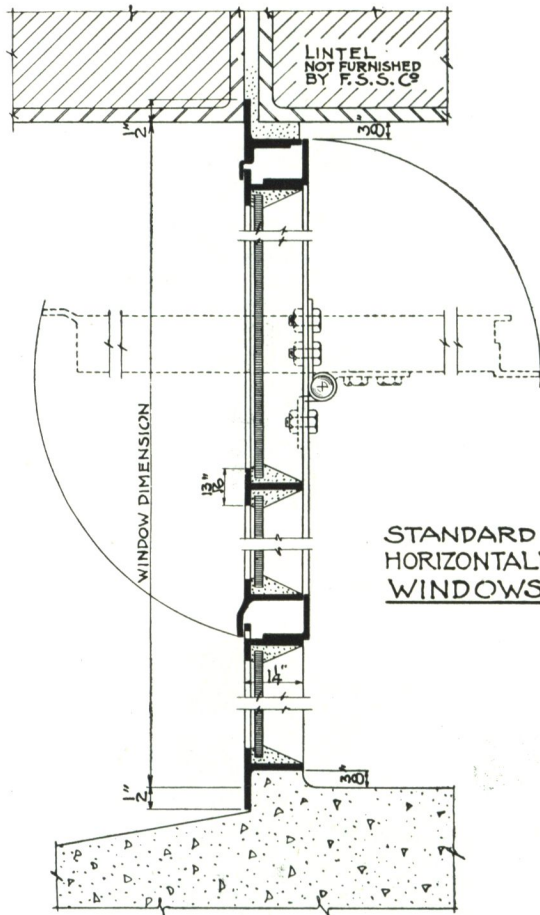
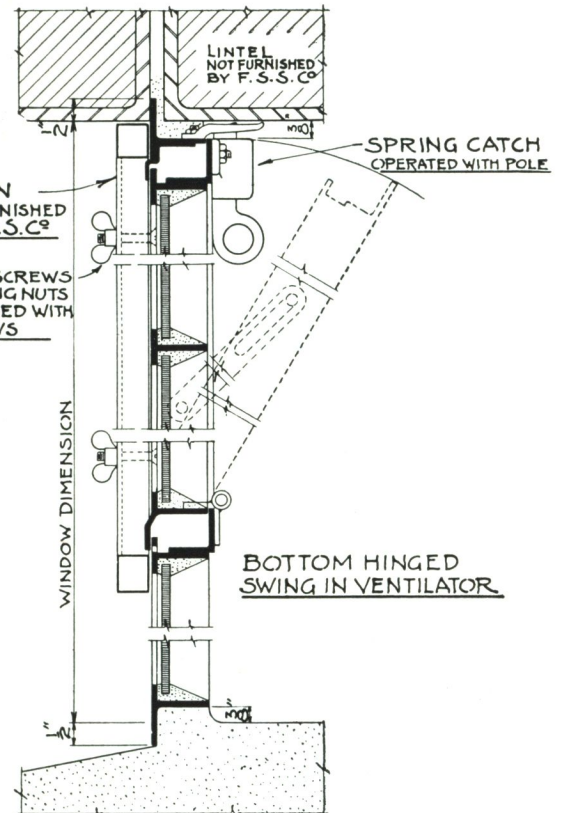


TABLE OF HORIZONTAL MULLIONS				
12x18	GLASS SIZE		14x20	
TOTAL NO LIGHTS WIDE	VERTICAL DISTANCE BETWEEN UNIT DIMENSIONS	SIZE OF MATERIAL		TOTAL NO LIGHTS WIDE
3 to 6 INCL.	24"	1-L 2x12x18 1-L 1x1x8	B	3 to 6 INCL.
3 to 9 INCL.	5"	2-15 22x22x3/8 1-PL 6x4	C	3 to 8 INCL.
10 to 13 INCL.	54"	2-15 22x22x3/8 1-PL 6x4	D	9 to 11 INCL.
10 to 13 INCL.	54"	1-4" CHANNEL 1-L 32x22x4	E	9 to 11 INCL.
14 to 18 INCL.	68"	2-15 3x3x5/8 1-PL 6x4	F	12 to 16 INCL.
14 to 18 INCL.	68"	1-6" CHANNEL 1-L 4x3x5/8	G	12 to 16 INCL.

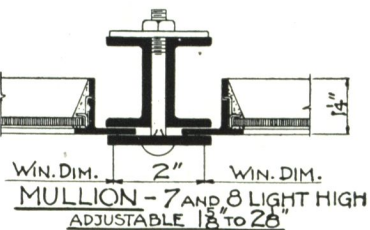
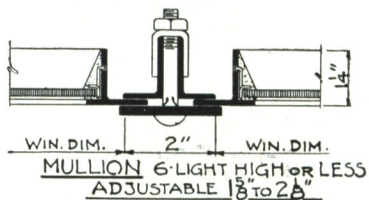
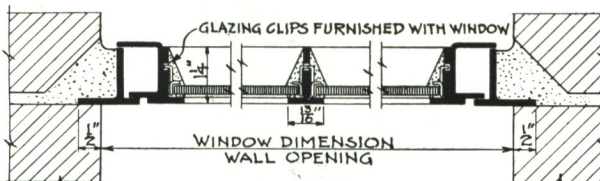
NOTE:
DOTTED LINES INDICATE METHOD OF
FITTING COVER PLATES TO
HORIZONTAL MULLIONS



**STANDARD
HORIZONTALLY PIVOTED
WINDOWS**



**BOTTOM HINGED
SWING IN VENTILATOR**



12	11	12	11	12
18	17	17	17	18
12	11	12	11	12
18	17	17	17	18
12	11	12	11	12
18	17	17	17	18

12x18 GLASS

14	13	14	13	14
20	19	19	19	20
14	13	14	13	14
20	19	19	19	20
14	13	14	13	14
20	19	19	19	20

14x20 GLASS

**BOTTOM HINGED SWING IN VENTILATORS
SAME GLASS SIZES FOR HORIZONTALLY PIVOTED**

12	11	12	11	12
18	16	16	16	18
12	11	12	11	12
18	16	16	16	18
12	11	12	11	12
18	16	16	16	18

12x18 GLASS

14	13	14	13	14
20	18	18	18	20
14	13	14	13	14
20	18	18	18	20
14	13	14	13	14
20	18	18	18	20

14x20 GLASS



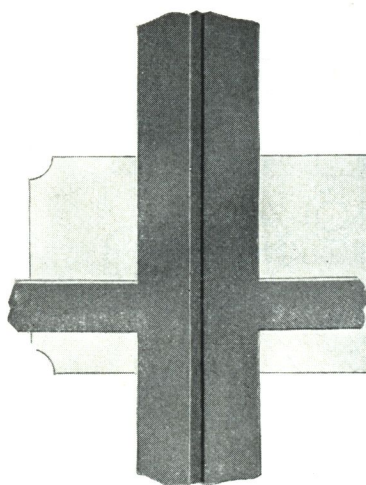
**PUSH BAR
FOR VENTILATORS
WITHIN REACH**



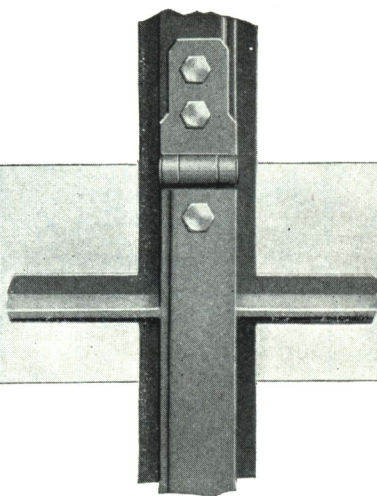
**CHAIN FASTENER No 107
SILL 6 FT OR MORE
FROM FLOOR**



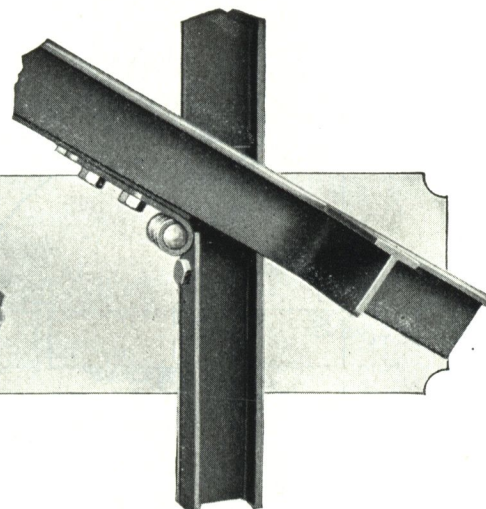
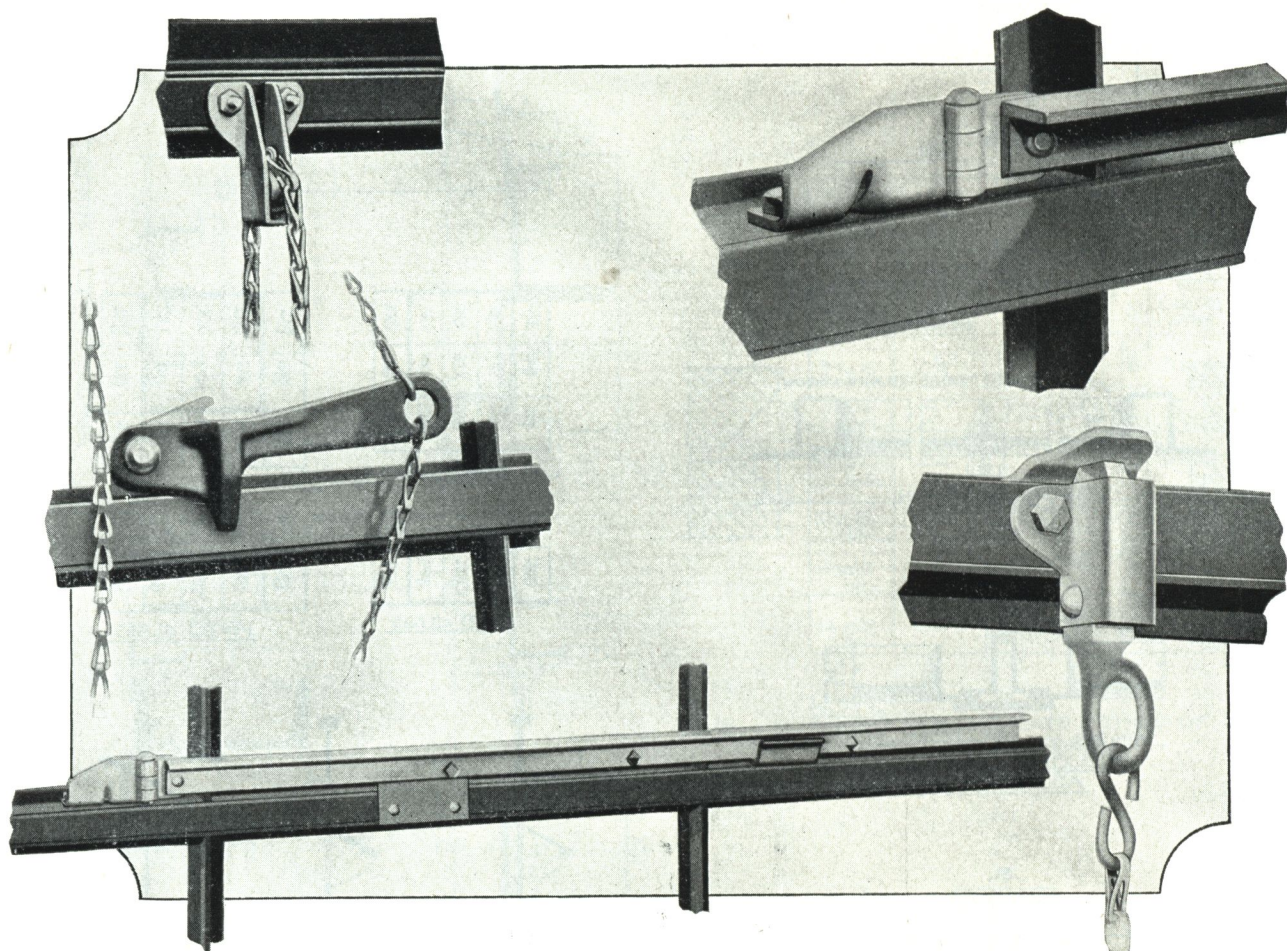
**CHAIN FASTENER No 106
SILL NOT MORE THAN
6 FT FROM FLOOR
CAM HANDLE-CHAIN & ROLLER**



Exterior View of Pivot



Interior View of Pivot

View of Pivot with Ventilator
Partly Open

Cam latch at ventilator sill and chain roller at head for manual operation of ventilators, the sills of which are not within reach from the floor.

Spring catch is used where specified at top of ventilator.

Standard Federal Push Bar for manual operation of ventilators, the sills of which are within reach from the floor. See enlarged detail of hinge and pin attachment forming universal joint. The Federal Push Bar has a lever draw tight action over a center plate.

(A12) UNDERWRITERS' LABELED WINDOWS

Note: The following requirements are those established by the Underwriters' Laboratories, Inc. effecting solid steel horizontally pivoted windows.

(A12a) Single Units

Single units cannot exceed 7x12 ft. in size, either dimension being height or width.

(A12b) Multiple Units

Window openings over 7 ft. wide but not exceeding 12 ft. high can be filled by using permissible units combined with underwriters' mullions.

Window openings over 12 ft. in height must have horizontal mullions approved by the Underwriters' Laboratories, Inc.

(A12c) Glass and Glazing

Single panes of glass cannot exceed 300 sq. in. in area. All glass must be retained by steel glazing angles.

(A12d) Ventilators

There is no restriction on the number or location of ventilators in a single unit or in a combination of units.

(A12e) Hardware

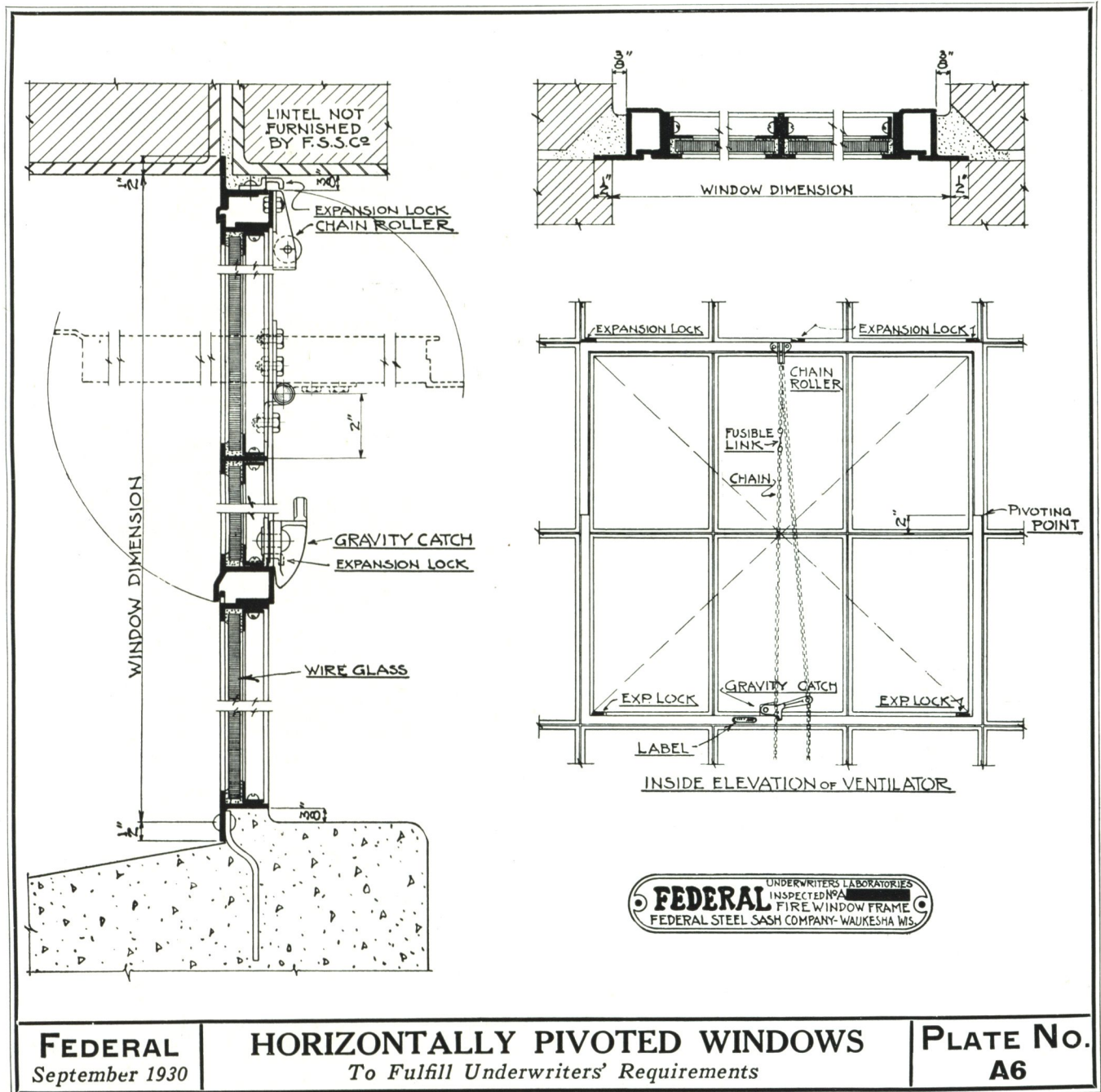
Gravity lock and chain rollers are customarily required; however, push bar operators may be used where local building ordinances permit.

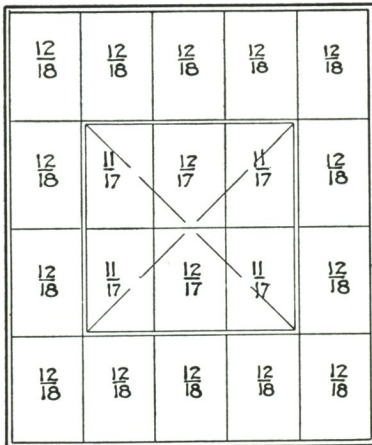
(A12f) Labels

Each unit must be provided with manufacturer's name plate and Underwriters' Laboratories, Inc. label.

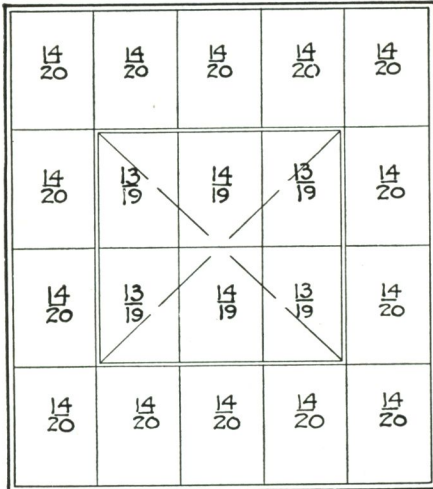
(A12g) Specifications

All underwriters' horizontally pivoted windows shall fulfill all requirements of the Underwriters' Laboratories, Inc. and shall be provided with underwriters' labels.

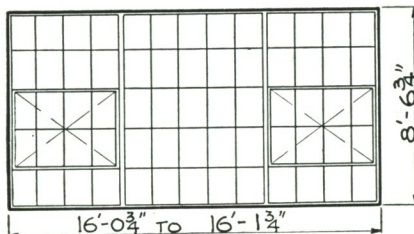




54161 - 12x18 GLASS



54161 - 14x20 GLASS



COMPUTING WALL OPENING

1-UNIT 45181-1 1/2x20 = 4-10 3/8

1-MULLION BAR = 2 (1 1/8 TO 2 1/8)

1-UNIT 55 - 1 1/2x20 = 6-0 3/4

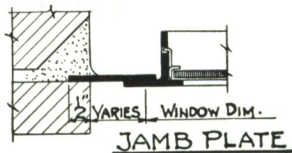
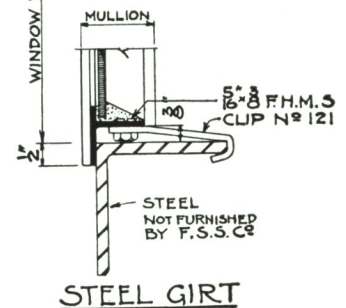
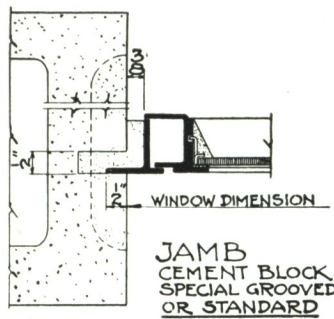
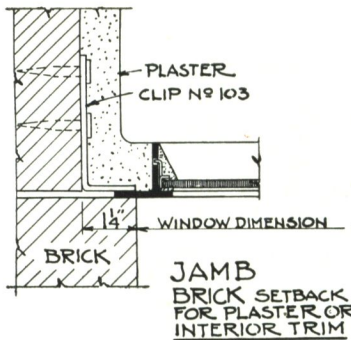
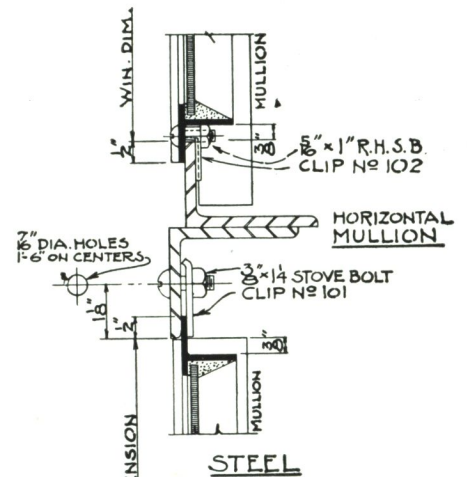
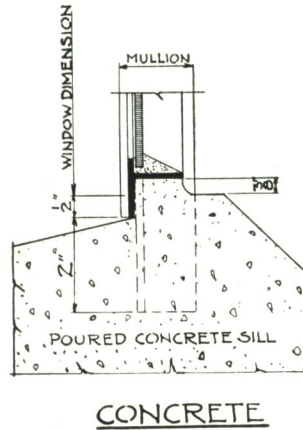
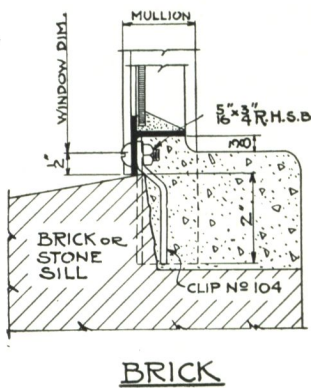
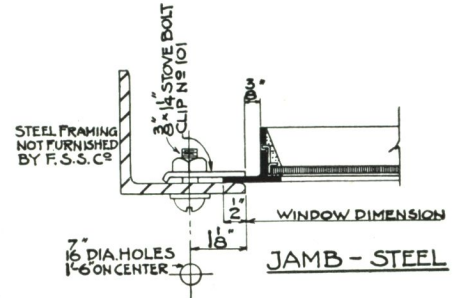
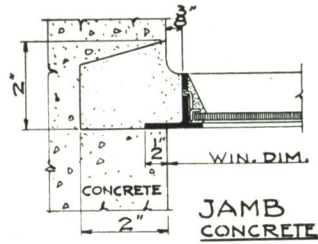
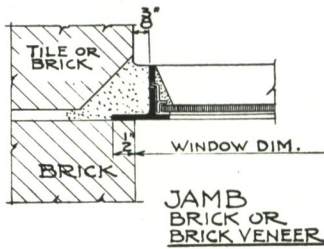
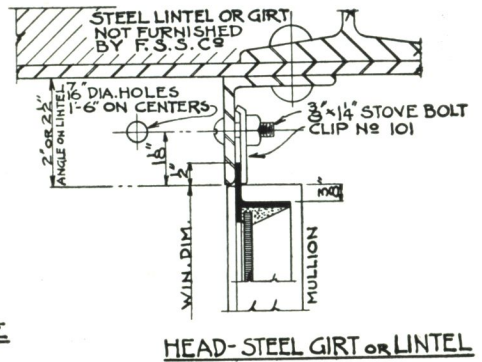
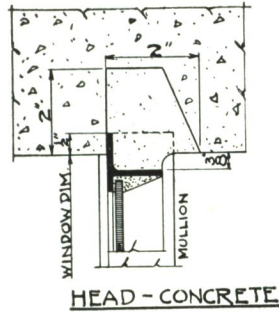
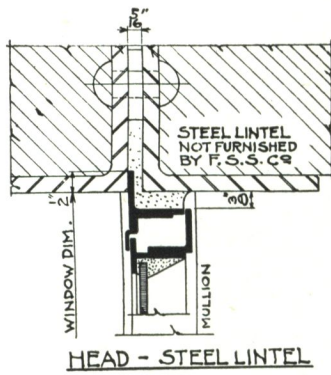
1-MULLION BAR = 2 (1 1/8 TO 2 1/8)

1-UNIT 45181 1 1/2x20 = 4-10 3/8

TOTAL 16-1 1/2 (16-0 3/4 TO 16-1 3/4)

TABLE OF SYMMETRICAL COMBINATIONS

12×18 Height of Opening	Lights High	14×20 Height of Opening	Number of Lights in Width of Opening	Number of Units To Fill Opening	Number of Lights in Each Unit and Number Units to Fill Opening
1'-7¼"	1	1'-9¼"			
3'-1⅝"	2	3'-5⅝"			
4'-8"	3	5'-2"			
6'-2⅜"	4	6'-10⅜"			
7'-8¾"	5	8'-6¾"			
9'-3⅛"	6	10'-3⅛"			
10'-9½"	7	11'-11½"			
Width of Opening					
12×18	14×20				
2'-1⅝"	2'-5⅝"		2	1	2
3'-2"	3'-8"		3	1	3
4'-2⅜"	4'-10⅜"		4	1	4
4'-5¼"	5'-1¼"		4	2	2, 2
5'-2¾"	6'-0¾"		5	1	5
6'-3⅛"	7'-3⅛"		6	1	6
6'-6"	7'-6"		6	2	3, 3
7'-6⅜"	8'-8⅜"		7	2	4, 3
8'-6¾"	9'-10¾"		8	2	4, 4
9'-10"	11'-4"		9	3	3, 3, 3
10'-7½"	12'-3½"		10	2	5, 5
10'-10⅜"	12'-6⅜"		10	3	3, 4, 3
11'-10¾"	13'-8¾"		11	3	3, 5, 3
11'-10¾"	13'-8¾"		11	3	4, 3, 4
12'-8¼"	14'-8¼"		12	2	6, 6
12'-11⅞"	14'-11⅞"		12	3	4, 4, 4
13'-2"	15'-2"		12	4	3, 3, 3, 3
13'-11½"	16'-1½"		13	3	4, 5, 4
13'-11½"	16'-1½"		13	3	5, 3, 5
14'-11⅞"	17'-3⅞"		14	3	4, 6, 4
14'-11⅞"	17'-3⅞"		14	3	5, 4, 5
15'-2¾"	17'-6¾"		14	4	3, 4, 4, 3
16'-0¼"	18'-6¼"		15	3	5, 5, 5
16'-0¼"	18'-6¼"		15	3	6, 3, 6
16'-6"	19'-0"		15	5	3, 3, 3, 3, 3
17'-0⅝"	19'-8⅝"		16	3	5, 6, 5
17'-0⅝"	19'-8⅝"		16	3	6, 4, 6
17'-3½"	19'-11½"		16	4	4, 4, 4, 4
17'-3½"	19'-11½"		16	4	3, 5, 5, 3
17'-6⅜"	20'-2⅜"		16	5	3, 3, 4, 3, 3
18'-1"	20'-11"		17	3	6, 5, 6
18'-6¾"	21'-4¾"		17	5	3, 4, 3, 4, 3
19'-1⅜"	22'-1⅜"		18	3	6, 6, 6
19'-4¼"	22'-4¼"		18	4	3, 6, 6, 3
19'-4¼"	22'-4¼"		18	4	4, 5, 5, 4
19'-7⅞"	22'-7⅞"		18	5	3, 4, 4, 4, 3
20'-7½"	23'-9½"		19	5	3, 5, 3, 5, 3
21'-5"	24'-9"		20	4	5, 5, 5, 5
21'-5"	24'-9"		20	4	4, 6, 6, 4
21'-7⅞"	24'-11⅞"		20	5	4, 4, 4, 4, 4
21'-10¾"	25'-2¾"		20	6	3, 3, 4, 4, 3, 3



(B) COMMERCIAL PROJECTED WINDOWS—Specifications

Note: Notes are explanatory or advisory only and should not be included in the specifications.

(B1) Work Included

Note: List and locate all commercial projected windows either in schedules on plans or here to assure accuracy in estimates.

(B2) General

Commercial projected windows shall be Federal electric arc welded windows, manufactured by FEDERAL STEEL SASH COMPANY, Waukesha, Wisconsin, or equivalent, meeting fully this company's standard of quality.

(B3) Shop Drawings

Furnish in (duplicate) (triplicate) for approval of the architect, complete shop drawings of all work, showing accurately all details of location, hardware and installation.

(B4) Materials

(B4a) Sections—All sections shall be open hearth solid steel, hot rolled or cold drawn, of special Federal design. Frame and muntin sections shall be 1¼ in. in depth.

(B4b) Vertical Mullions—Vertical mullions shall consist of an exterior plate, two interior angles, cadmium plated U-clips and bolts. For windows 7 lights high and over, mullions shall consist of an exterior plate, two interior channels, clips and bolts.

(B4c) Horizontal Mullions—Horizontal mullions shall be FEDERAL STEEL SASH COMPANY standard.

Note: See Plate A3.

Note: Horizontal mullions should be furnished under structural steel specifications.

(B4d) Mullion Covers—Mullion covers shall be of pressed steel.

(B5) Construction

(B5a) Fabrication—All joints and connections shall be full electric arc welded.

(B5b) Frames—Frame members shall be continuous from head to sill and jamb to jamb, mitered at corners and electric arc welded.

(B5c) Muntins—Horizontal muntin bars shall be continuous from jamb to jamb. Vertical muntins shall be cut to fit horizontal muntins and frames and electric arc welded thereto.

(B5d) Weathering—Ventilators shall have double contact weathering continuous around all four sides.

(B5e) Vertical Mullions—Where two or more windows are placed side by side in the same opening, provide Federal universal adjustable vertical mullions. All mullions shall extend 2 in. into sills for anchorage.

(B5f) Horizontal Mullions—Where two or more windows are placed one above another in the same opening, provide Federal standard horizontal mullions. In masonry provide at least 4-in. bearing at each end and in structural steel openings arrange for proper attachment.

(B5g) Mullion Covers—Provide mullion covers for (vertical) (horizontal) mullions where called for on plans.

(B5h) Clips—Furnish all necessary clips and bolts for attaching windows to structural steel.

Note: Include in steel specifications all punching to accommodate clips.

(B5i) Masonry Anchors—Furnish where called for: masonry anchors and bolts for attachment.

(B6) Operation and Hardware

(B6a) Ventilator Operation—Ventilators shall swing out from the sill and down from the head or vice versa, as indicated on the plans.

(B6b) Stay Arms and Friction Guides—Each ventilator shall be balanced on two supporting steel arms with ends pivoted on both ventilator and frame.

Friction guides shall be single point contact with spring actuated bronze swiveling yoke carrying a hardened steel contact ball operating on a steel guide angle.

(B6c) Hardware

Note: Malleable iron hardware is attached at factory. Bronze hardware is shipped separate.

(1) For Swing-out Ventilators—Provide (malleable iron) (bronze) pole ring at head; pressed steel bracket; and (malleable iron) (bronze) cam handle.

(2) For Swing-in Ventilators—Provide (malleable iron) (bronze) spring latch and keeper at ventilator head.

(B6d) Shade Brackets

Note: All shades must be located at least 2 in. from the inside face of window to clear hardware. Shades cannot be satisfactorily installed where ventilators project in from the head.

Provide at top window jamb sections shade bracket clips to receive shade brackets furnished and applied by others after windows have been erected.

Note: Where windows are erected by FEDERAL STEEL SASH COMPANY, it will attach shade bracket clips.

(B7) Painting

(B7a) All windows shall be given one dip-coat of gray mineral paint by the manufacturer before shipment.

Note: Provide for the following in the painting specification: One field coat of paint should be applied after erection and before glazing. The application of one or more additional coats should be deferred until at least three weeks after glazing to allow putty to set.

(B7b) After erection and before glazing, all windows shall be given one coat of paint in the field. Paint shall be (specify).

Note: Where windows are erected by FEDERAL STEEL SASH COMPANY, it will do field painting where specified. (See Page 1.)

(B8) Hot Galvanizing or Rust Proofing

Note: See Page 3.

All windows shall be (hot dip galvanized) (cadmium plated) (other rust proof coated) after fabrication.

Note: Do not paint for at least one year.

(B9) Erection

Note: Include in masonry specifications that all masonry openings shall be accurately prepared in accordance with Federal installation details. (See Page 4.)

Note: Include in masonry specifications that all mortar grouting, mastic, pointing, etc., shall be done by the masonry contractor after windows have been erected.

(B9a) All windows shall be erected by FEDERAL STEEL SASH COMPANY in openings prepared by others.

Note: See Page 1.

(B9b) All windows shall be set plumb and true in perfect alignment and securely anchored before glazing.

(B9c) Apply all unattached hardware in accordance with the manufacturer's directions.

(B10) Glass and Glazing

Note: Include the following in the Glazing Specification.

Note: See Page 4.

(B10a) Glass—Glass shall be (¼ in. rough wire) (¼ in. factory ribbed) (½ in. factory ribbed) (double strength grade A) (double strength grade B).

(B10b) Putty—Putty shall be high grade steel window putty.

Note: See Page 4.

(B10c) Glazing—All commercial projected windows shall be glazed from the inside. Bed all glass in putty and secure with steel spring wire glazing clips furnished by window manufacturer. Face putty shall be applied in a neat, smooth manner.

Note: Do not paint until putty has set—see (A8).

(B11) Underwriters' Labeled Windows

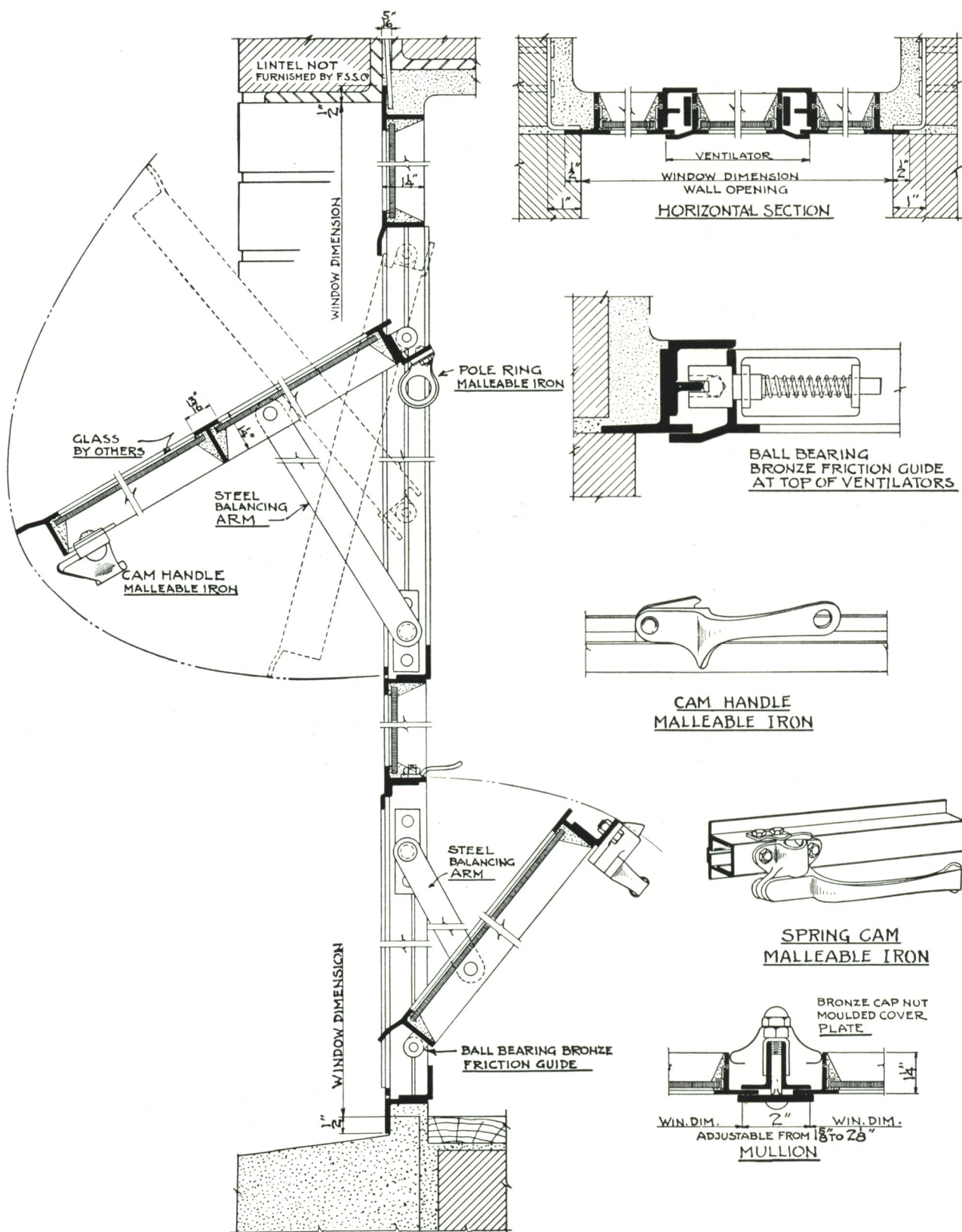
Note: Commercial projected windows fulfilling Underwriters' Laboratories, Inc., requirements can be furnished, provided all ventilators swing out from the sill and down from the head. The Laboratories will not label a ventilator which swings in from the head and up from the sill. Requirements and specifications for Underwriters' Labeled commercial projected windows are given on Page 11 for pivoted windows.

STANDARD AND LISTED SPECIAL

2-1 $\frac{1}{2}$ 2-5 $\frac{1}{2}$	3-2 3-8	4-2 $\frac{3}{4}$ 4-10 $\frac{3}{4}$	5-2 $\frac{3}{4}$ 6-0 $\frac{3}{4}$	12x18 GLASS 14x20	2-1 $\frac{1}{2}$ 2-5 $\frac{1}{2}$	3-2 3-8	3-2 3-8	3-2 3-8	4-2 $\frac{3}{4}$ 4-10 $\frac{3}{4}$	5-2 $\frac{3}{4}$ 6-0 $\frac{3}{4}$	5-2 $\frac{3}{4}$ 6-0 $\frac{3}{4}$	5-2 $\frac{3}{4}$ 6-0 $\frac{3}{4}$	12x18 14x20
3-1 $\frac{1}{2}$ 3-5 $\frac{1}{2}$	32160	42140	52160	22140									
4-8 5-2	23141	33161	43141	53161									
6-2 $\frac{3}{4}$ 6-10 $\frac{3}{4}$	34161	44141	54161	24141									
6-2 $\frac{3}{4}$ 6-10 $\frac{3}{4}$	3423602	4422402	5423602	34162									
7-8 $\frac{3}{4}$ 8-6 $\frac{3}{4}$	35161	45141	55161	25141									
7-8 $\frac{3}{4}$ 8-6 $\frac{3}{4}$	35162		55162	35163									
7-8 $\frac{3}{4}$ 8-6 $\frac{3}{4}$	3523602	4522402	5523602	3523603	352603								
9-3 $\frac{3}{4}$ 10-3 $\frac{3}{4}$	36161	46141	56161	36163									
9-3 $\frac{3}{4}$ 10-3 $\frac{3}{4}$	3623603	4622403	5623603	46143	56163								
9-3 $\frac{3}{4}$ 10-3 $\frac{3}{4}$	362614	562614											
10-9 $\frac{1}{2}$ 11-11 $\frac{1}{2}$	372614	572614											
12x18 GLASS 14x20 GLASS				37161	37164	3723604	472414	57161	57164	5723604			

-S UNITS INDICATED THUS ARE LISTED SPECIAL

FEDERAL
September 1930COMMERCIAL PROJECTED WINDOWS
Types and SizesPLATE No.
B1



(C) CONTINUOUS TOP HUNG WINDOWS—Specifications

Note: Notes are explanatory or advisory only and should not be included in the specifications.

Note: Structural steel girts, at heads and sills are not furnished by the window manufacturer. These should be provided for under the Structural Steel Specifications. All punching for window butts or clips should be done in the field by the window erector to avoid inaccuracies usually attendant when the punching is done by the structural steel fabricator. See (C10c.)

Note: Sheet metal flashings at heads, sills and ends of runs are not furnished by the window manufacturer. These should be provided for under the Roofing and Sheet Metal Specifications.

(C1) Work Included

Note: Locate and show cross sections of all continuous top hung windows on plans and specify whether swing or stationary.

(C2) General

Continuous top hung windows shall be Federal electric arc welded windows, manufactured by FEDERAL STEEL SASH COMPANY, Waukesha, Wisconsin, or equivalent meeting fully this company's standard of quality.

Note: Continuous windows are generally used in monitor and saw-tooth roof construction, but sometimes in side wall construction. Continuous windows should not be set on a slope exceeding 30° from the vertical. They provide an easily and rapidly operated continuous window opening.

Note: Windows should not exceed 6 ft. in height. Difficulties in handling, shipping, erecting and glazing make heights in excess of 6 ft. undesirable.

Note: Panels should not exceed 16 ft. in length.

(C3) Shop Drawings

Furnish in (duplicate) (triplicate) for approval of architect, complete shop drawings of all work, showing accurately all dimensions and details of location, installation, operator attachment, hardware and glass sizes.

(C4) Material

(C4a) Sections—All sections shall be open hearth solid steel, hot rolled or cold drawn, of special Federal design. Panel head and end members shall be angles. Muntins shall be 1¼x1½ tees. Sills shall be heavy channel sections equipped with glass stop.

(C5) Construction

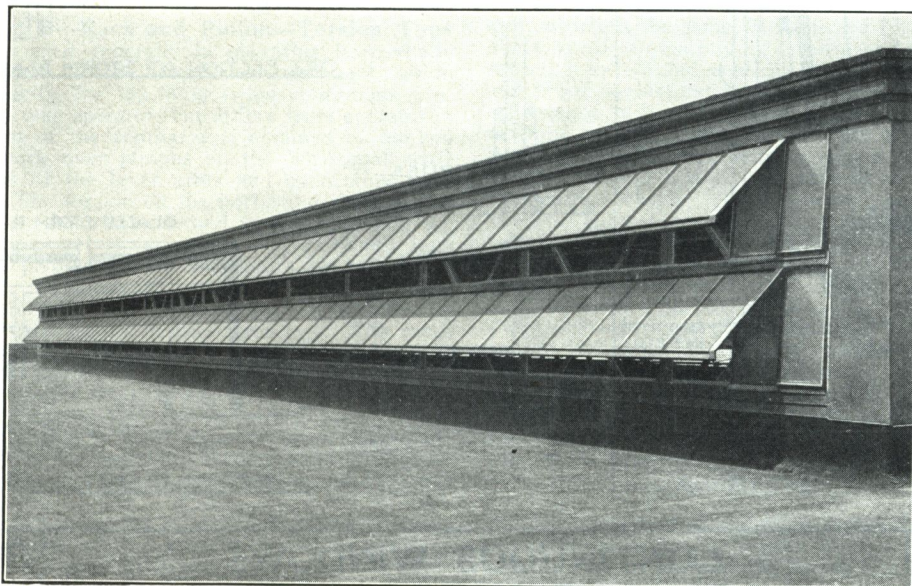
(C5a) Fabrication—All joints and connections shall be full electric arc welded.

(C5b) Window Panels—Panels shall be joined end to end by bolting end angles back to back.

(C5c) Muntins—Muntins shall be spaced 2 ft. 0 in. on center.

(C5d) Expansion Joints—Provide expansion joints where necessary to compensate for expansion and contraction.

(C5e) Storm Panels—Where called for on plans, provide storm panels. Storm panels shall be secured to head and sill with steel clips and shall underlap the swing section and shall be provided at the sill with a continuous drip set over the sill flashing.



Top Hung Windows, Sewage Disposal Plant, Milwaukee, Wis.

(C6) Hardware

Note: Fittings for attaching operators to top hung swing windows are furnished by the window manufacturer and shipped with operator equipment.

(C6a) Butts and Clips—All swing windows shall be hinged on heavy malleable iron butts with bronze pins spaced 4 ft. on centers. Butts shall be bolted to window head and the building girts. Fixed windows shall be attached to building with heavy angle clips at head and with suitable straps at sill.

(C7) Mechanical Operators

Note: Specifications for mechanical operators are given on Page 19. Where specified provision is made on swing windows for operator attachment.

(C8) Painting

(C8a) All windows shall be given one coat of gray mineral paint by the manufacturer before shipment.

Note: Provide for the following in the Painting Specifications: One field coat of paint shall be applied after erection but before glazing. The application of one or more additional coats should be deferred until at least three weeks after glazing to allow putty to set.

(C8b) After erection and before glazing, all windows shall be given one coat of paint in the field. Paint shall be (specify).

Note: Where windows are erected by FEDERAL STEEL SASH COMPANY, it will do field painting where specified. (See Page 1.)

(C9) Hot Galvanizing or Rust Proofing

Note: See Page 3.

All windows shall be (hot-dip galvanized), (cadmium plated) (other rust proof coated), after fabrication.

Note: Do not paint for at least one year.

(C10) Erection

(C10a) All windows shall be erected by FEDERAL STEEL SASH COMPANY.

(C10b) Where operators are used in connection with continuous swing windows, operators shall be erected with the windows and before glazing.

Note: See Page 1.

(C10c) All holes in structural steel for attachment of continuous window butts, clips, etc., shall be punched in the field by the window erector.

Note: Due to inaccuracies in structural work, field punching is recommended as the best practice.

(C10d) All windows shall be erected in a workmanlike manner and properly weathered at head, sill and jambs.

(C11) Glass and Glazing

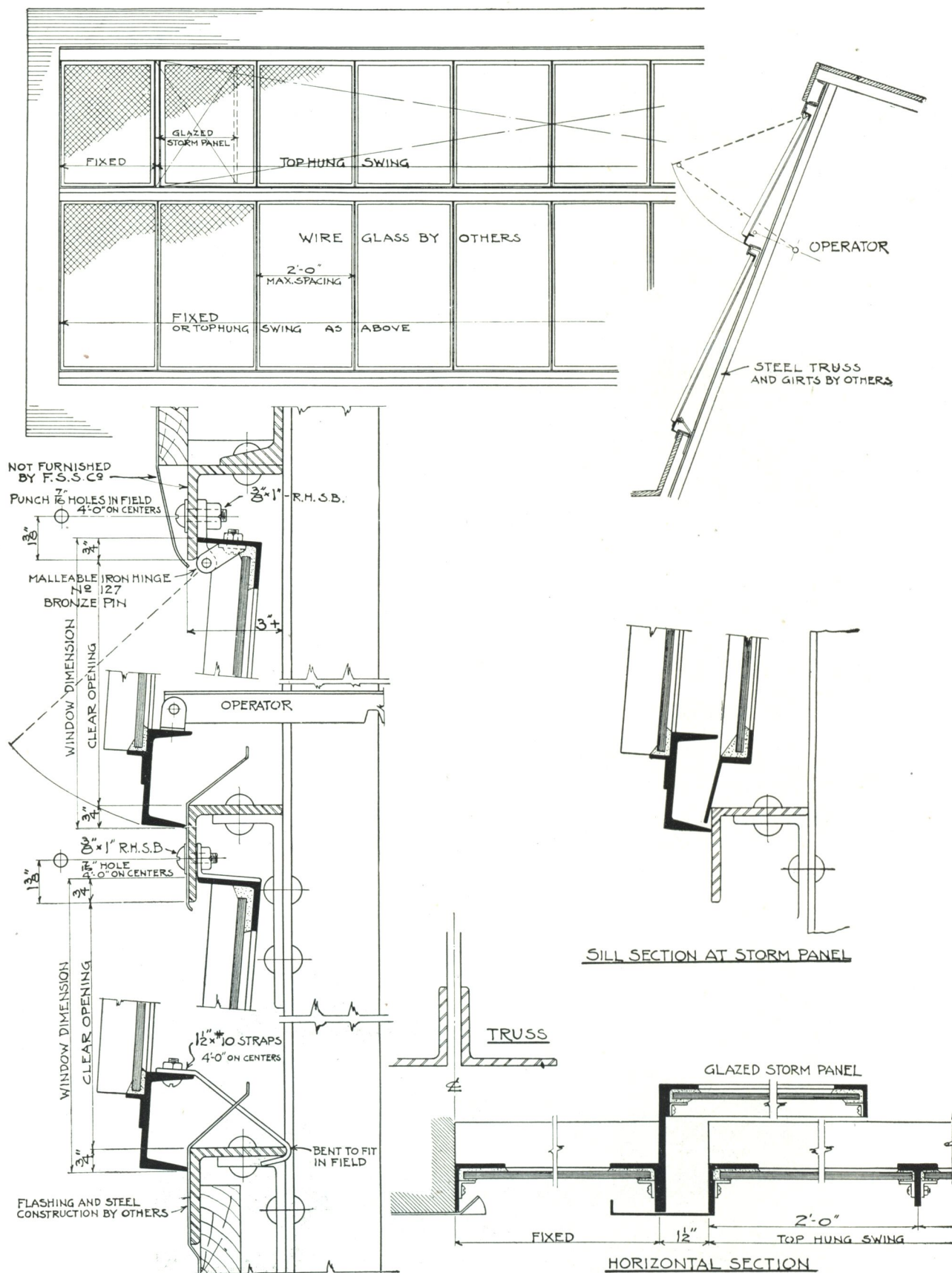
(C11a) Glass—Glass shall be ¼ in. rough wire glass.

(C11b) Putty—Putty shall be high grade steel window putty.

Note: See Page 4.

(C11c) Glazing—Continuous windows shall be glazed from the outside. Bed all glass in putty and secure at vertical muntins and panel ends with steel angle clips bolted through window members. Face putty at sill only in a neat, smooth manner.

Note: Do not paint until putty has set. See (C8).



FEDERAL
September 1930

CONTINUOUS WINDOWS

Typical Details

PLATE No.
C1

(D) MECHANICAL OPERATING DEVICES—General

Operators furnished with Federal windows are of two general types—one the torsion type, which uses a revolving shaft, and the other the tension type, in which the shaft moves in a horizontal direction. Descriptions of the various operators furnished are given below.

These operators have been used for many years and they have proven their thorough practicability—FEDERAL STEEL SASH COMPANY responsibility covering operating devices as fully as it covers Federal windows.

The design of each individual building, the uses to which the building is put, the manufacturing processes involved, together with the limitations applying to each particular operator, must all be given consideration in the selection of the proper operator to be used. While the selection of the operator is not a complicated problem with those familiar with all the elements, we strongly recommend consultation before the selection and specification of this equipment.

In locating and installing mechanical operating devices, attention should be paid to the accessibility and convenience of location of the controls both for operation and for inspection and lubrication.

(D1) Description

(D1a) Operator A—Worm and Gear—Torsion Type

This operator is used most generally for horizontally pivoted, top pivoted and bottom hinged ventilators. It consists of a horizontal pipe shaft supported by roller-bearing brackets with adjustable steel legs which carry forged steel lever arms and steel connecting links for operating the ventilators. The shaft is rotated by means of an irreversible worm and gear power. The movement of the operating levers depends on the torsion of the shaft, and the ventilators are locked in any position.

Operation may be by means of a hand chain or by a vertical shaft with control located within convenient distance from the floor. The hand wheel in vertical shaft operation may be placed horizontally or vertically and where placed vertically may have either an open or enclosed gear box.

Idlers and universal joints are used to effect necessary changes in direction of operator chains or vertical shafting. Idlers are also used to support operator chains over long spans where the sag of the chain would be objectionable, and to anchor the chain at its lower end where the weight of the chain would be sufficient to cause it to pull out over the supporting idlers.

Multiple runs of ventilators, consisting of runs placed one above the other, can be operated from one control.

(D1b) Screw Type Group Control Operator—Worm and Gear—Torsion Type

This operator is very similar in design to Operator A. The difference is in the method of operating the vertical shaft, which in this operator is equipped with a hand wheel and screw by means of which the vertical shaft is raised or lowered.

It is used primarily for operating multiple horizontally pivoted ventilators in large unit openings.

This operator may, if desired, be equipped with electrical control and motor drive. For details of motor drive see (D1e).

(D1c) Operator B—Rack and Pinion—Torsion Type

This operator is used generally in operating horizontally pivoted, top pivoted and bottom hinged ventilators and, within the limits of its capacity, for top hung swing continuous windows. It is a torsion type operator, but differs from operator A in that the movement of the ventilator is obtained by toothed steel racks which work over pinions on the horizontal shaft instead of by means of the lever arms and connecting links used in operator A. The torsion on the horizontal shaft in this operator is reduced to the minimum and is constant, with the result that the lifting power is very great, and extremely long lines or large bays of pivoted window ventilators can be handled by this operator.

The operator consists of horizontal shaft supported by roller bearing brackets with adjustable steel legs. The racks are rolled steel and are furnished either straight or curved as desired. Curved racks are usually used where the projection of the rack into the building in the closed position of the ventilator would be objectionable.

Control may be either by hand chain or by vertical shaft equipped with either a horizontal or vertical hand wheel, the latter with either open or enclosed gear box, as noted under operator A above.

Idlers and universal joints are used to change the direction of the operator chains or of the vertical shafts in the same manner as explained for operator A above.

Electrical control and motor drive can be furnished with this operator. For details of electrical control and motor drive see (D1e).

(D1d) Tension Type Operator for Pivoted Windows

This operator differs from operators A and B in that the movement of the ventilators is accomplished by a horizontal movement of the shaft as distinguished from the rotary movement in operators A and B. It is used for horizontally pivoted, top pivoted or bottom hinged ventilators where exceptionally long runs of ventilators must be operated from one control.

The horizontal pipe shaft is supported by roller bearing brackets and travels in a horizontal direction. Lifting arms are attached to the horizontal shaft by a swivel clamp and to each ventilator by a hinged joint.

Power consists of a worm and gear set which operates a pinion engaging a rack attached to the shaft. The worm and gear set are enclosed in an oil tight box and run in oil. A positive action clutch acts as a limit stop when ventilators are in full open or closed position.

Either hand chain or electrical control and motor drive are used on this operator. Vertical shaft operation cannot be furnished. Where hand chain control is used, idlers are furnished to provide for change in direction of chain and for the other purposes already noted under operator A above.

Electrical control and motor drive are similar to the electrical control and motor drive used on tension operator C. See (D1e).

(D1e) Operator C—Tension Type

This operator is used only for continuous top hung swing windows. It is a tension type operator, the movement of the window being obtained through a horizontal movement of the shaft. This operator is used where the load is heavy and the conditions of operation severe and will handle longer and higher runs of continuous windows than will operator B.

The operator consists of a horizontal shaft supported by brackets, each bracket carrying two pipe rollers with brass bearings. Lifting arms of heavy steel sections, consist of two long members attached to a crosshead on the horizontal shaft and to the window, and of two short members attached to the center of the long members and to the shaft bracket. Brass washers are used throughout.

Power consists of a worm and gear set enclosed in an oil tight box and running in oil, which engages through a pinion with a heavy rack attached to the horizontal shaft. The power is always located at or near one end of the shaft so that as the window is opened by means of the horizontal movement in the shaft, the shaft itself is in tension. A positive action clutch is provided which acts as a limit stop when windows are in full open or closed position.

Operation may be either by hand chain, which is useful only where the load is not so great as to make manual operation laborious, or by electrical control and motor drive. Where hand chain operation is used, idlers are provided to effect change in direction of operator chain and for the other purposes noted under operator A above.

Electrical control and motor drive furnished on this operator, which is the same as furnished on other operators noted above, consists of a motor, a worm and gear drive, a magnetic reversing switch and control. Motor drive is compact, efficient, and proof against careless handling. The worm and gear unit consists of a hardened steel worm and a bronze gear, both machine cut and running in oil in an oil tight box. The motor is designed for a high starting torque. The speed reduction is obtained through a worm and gear set and silent chain operating over cut sprockets.

The control consists of an enclosed magnetic reversing switch with thermal overload relay and three-button operating switch. Buttons marked "Open" and "Close" will operate the window to its full open or to its tight closed position. Button at any position between extreme open or extreme closed. Two enclosed single pole limit switches are used in the secondary circuit of the control, which automatically open the circuit when the window reaches the extreme open or closed position, thus preventing damage through over travel of the operator. When the direction of the travel of the window is automatically stopped, the motor is reversed and will operate only in the opposite direction, preventing damage to the operating device and window because of over run in either direction.

The three-button operating switch can be located in any desired position for convenient operation. Wiring and conduits between the switch and the motor are not included with the motor power and control, as the location of the operating switch is, in all cases, special and must suit the condition of each particular installation.

(D2) SPECIFICATIONS

Note: Notes are explanatory or advisory only and should not be included in the specifications.

(D2a) Work Included

Note: Locate on plans each operator and control and the ventilators to be operated by each. For each operator indicate method of operation—either hand chain, vertical shaft or motor drive.

(D2b) General

All operators shall be Federal operator (A) (B) (screw type) (tension type for pivoted window ventilators) (C) as furnished by FEDERAL STEEL SASH COMPANY, Waukesha, Wisconsin, or equivalent, fully meeting this company's standard of quality.

(D2c) Shop Drawings

Furnish in (duplicate) (triplicate) for approval of architect, complete shop drawings of all operators showing accurately all details of location, installation and position of power and control.

(D2d) Limits

Individual operators shall be limited to length of shaft or number of ventilators or lengths of windows as indicated below:

Operator A—40 ft. each side of power.

Screw type operator—50 horizontally pivoted, or 20 top pivoted or bottom hinged ventilators.

Tension operator for pivoted windows—300 ft. of horizontal shaft per power.

Operator B (1) For horizontally pivoted ventilators—80 ft. of horizontal shaft on each side of power.

(2) Top pivoted or bottom hinged ventilators—40 ft. of horizontal shaft on each side of power.

(3) Continuous windows:

Note: Limits are determined by the height of the window, the degree of opening desired and the position from the vertical.

Operator C—

Note: Limits are determined by the height of the window, the degree of opening desired and the position from the vertical. Motor driven operators can handle longer runs than manual power operators.

(D2e) Electrical Control and Motor Drive

Note: Specify in Electrical Specifications that electrical contractor shall furnish and install safety type line switches, wire, conduit and fittings and do all wiring between control and motor in accordance with wiring diagram furnished by window manufacturer.

Window manufacturer shall furnish only motor, sprocket, chain, magnetic reversing switch, limit switch, individual push button station and wiring diagram.

(D2f) Painting

(D2g1) All operators are painted one coat of mineral paint by the manufacturer before shipment.

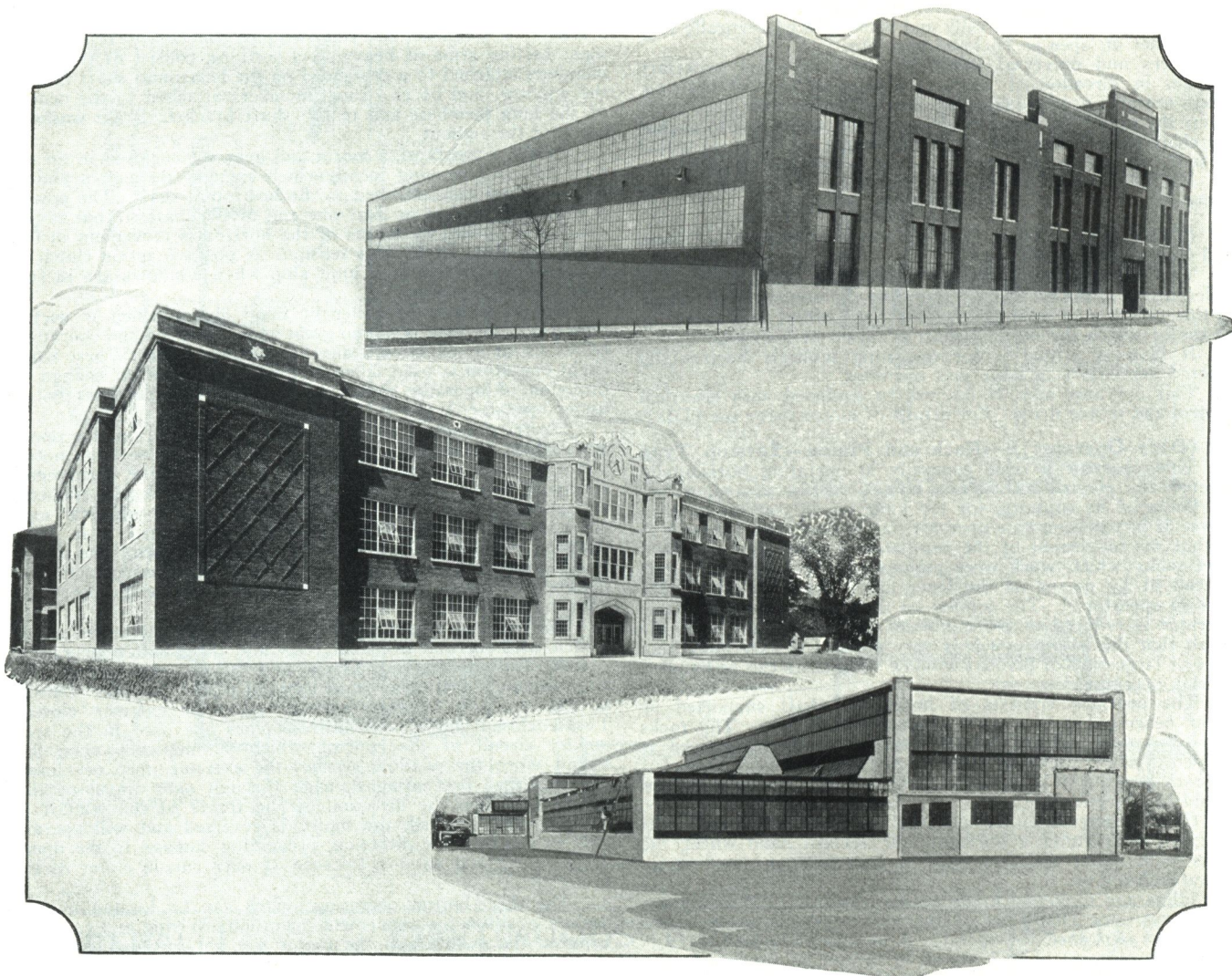
(D2g2) After erection all operators shall be given one coat of paint in the field. Paint shall be (specify).

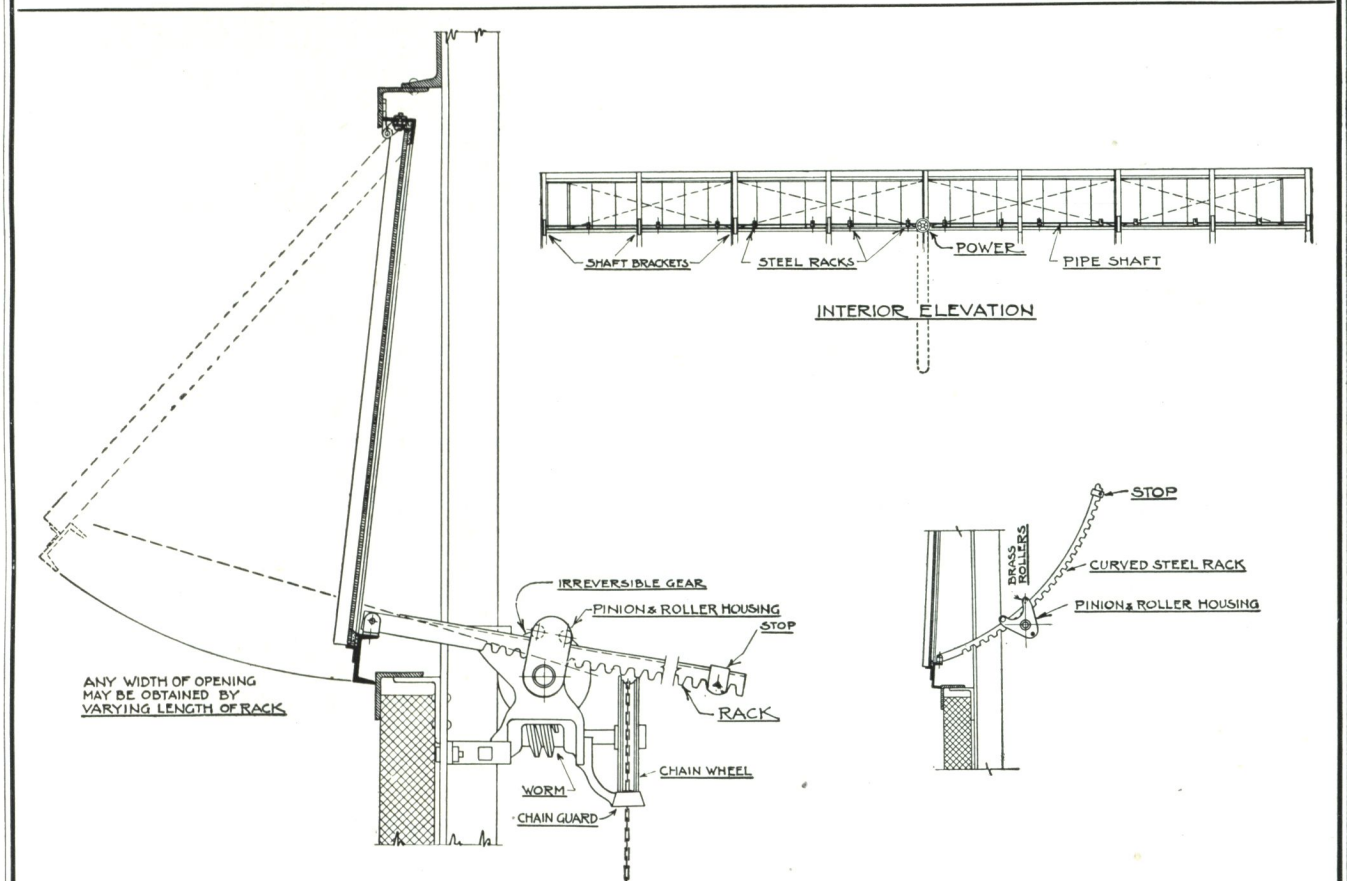
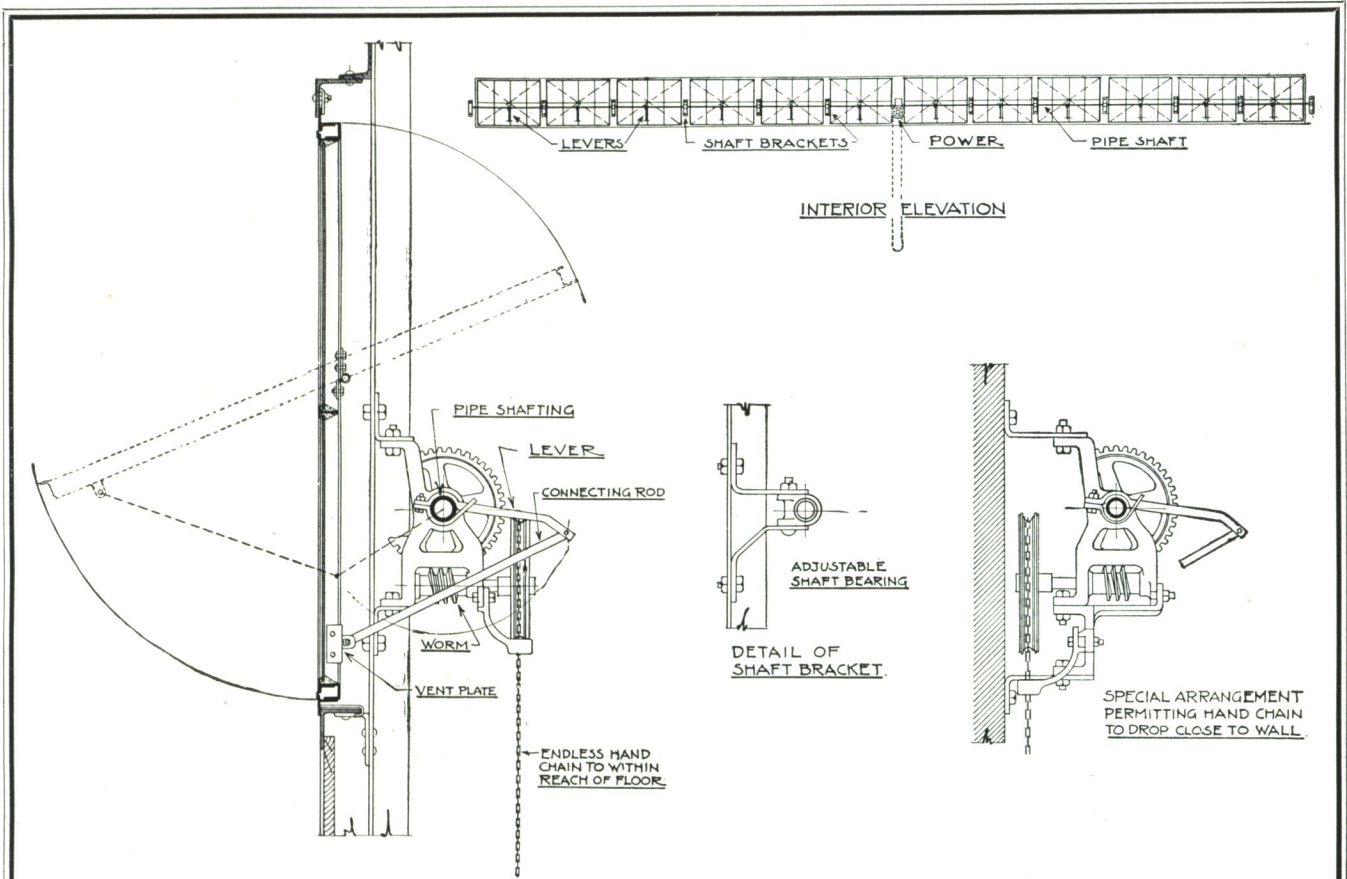
Note: Where operators are erected by FEDERAL STEEL SASH COMPANY, it will do painting where specified. (See Page 1.)

(D2g) Erection

All operators shall be erected by the window manufacturer before windows are glazed.

Note: See Page 1.

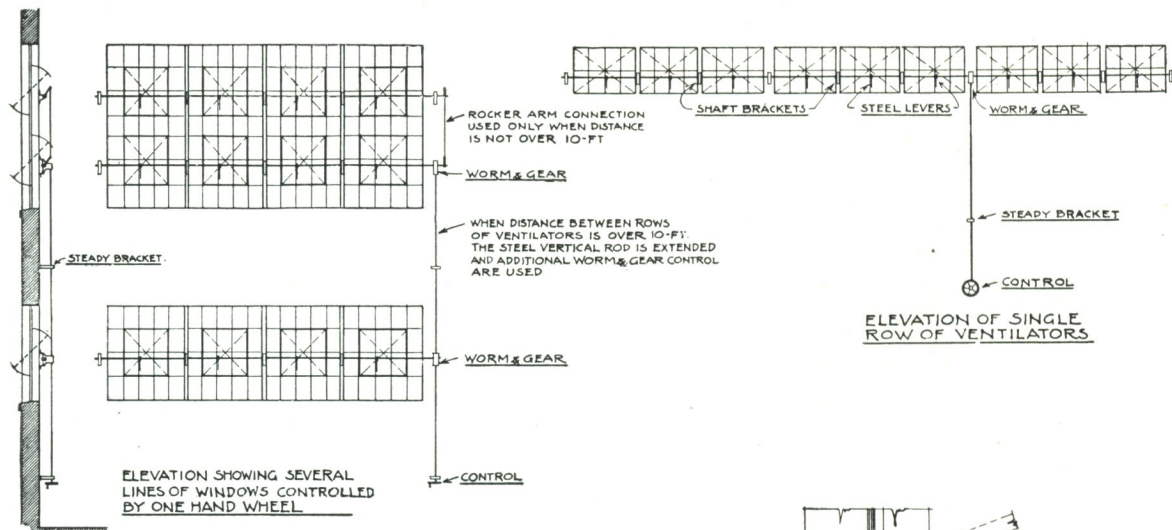




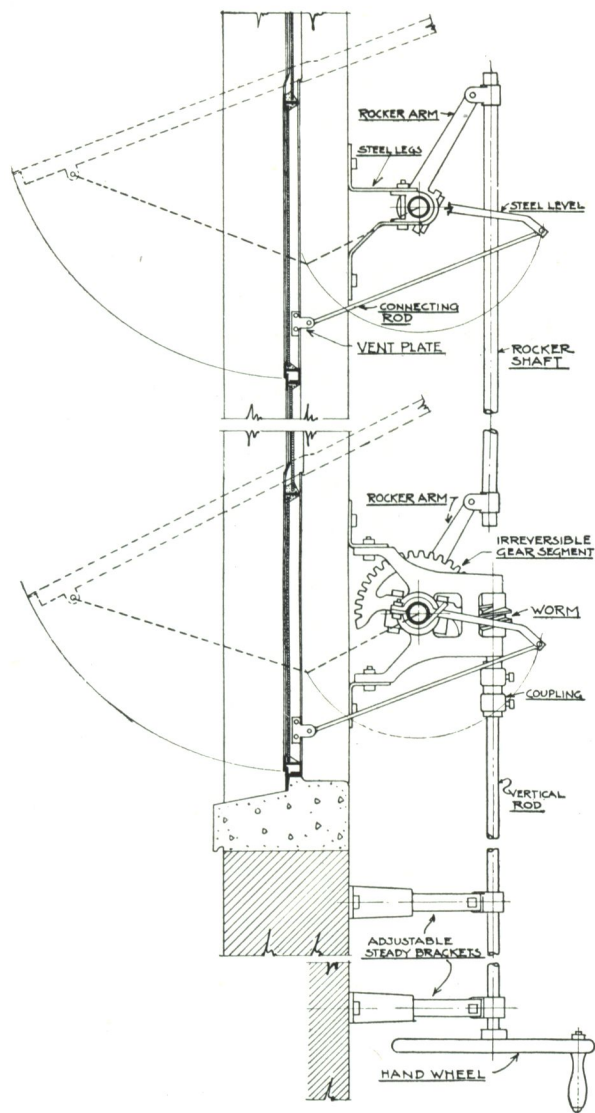
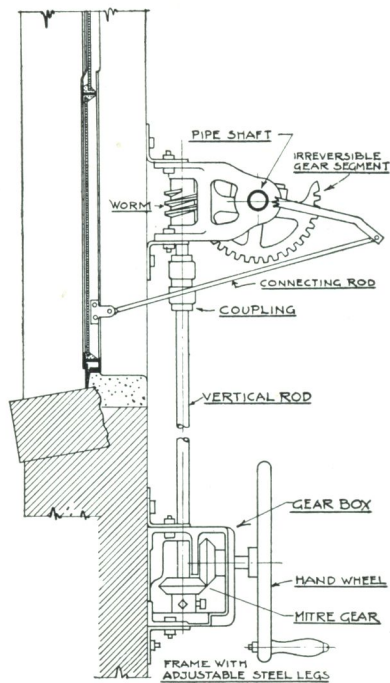
FEDERAL
September 1930

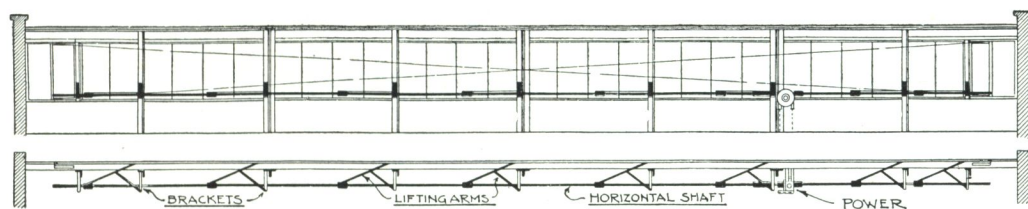
MECHANICAL OPERATORS
Operator A Above—Operator B Below

PLATE No.
D1—D3

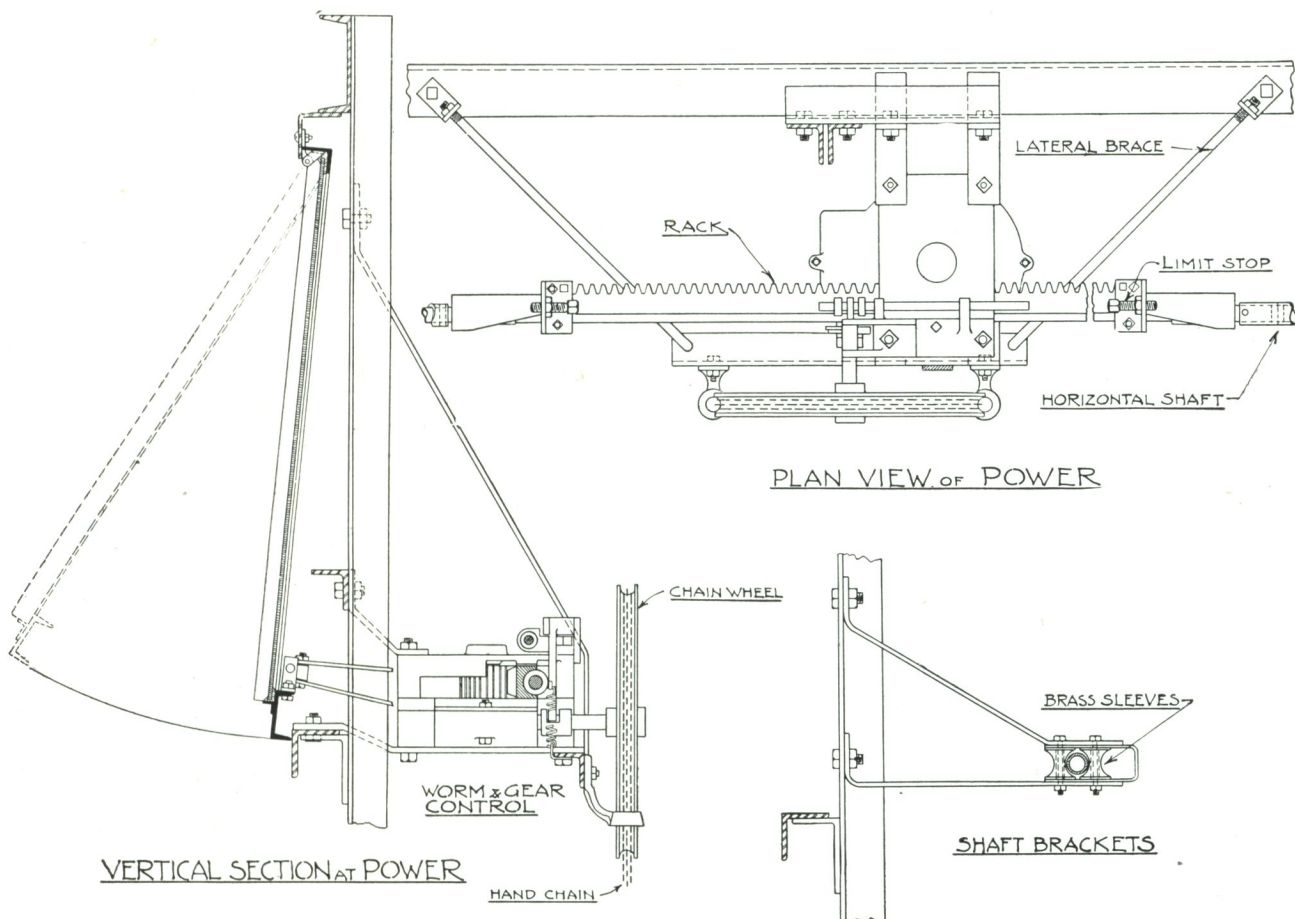


ELEVATION OF SINGLE ROW OF VENTILATORS





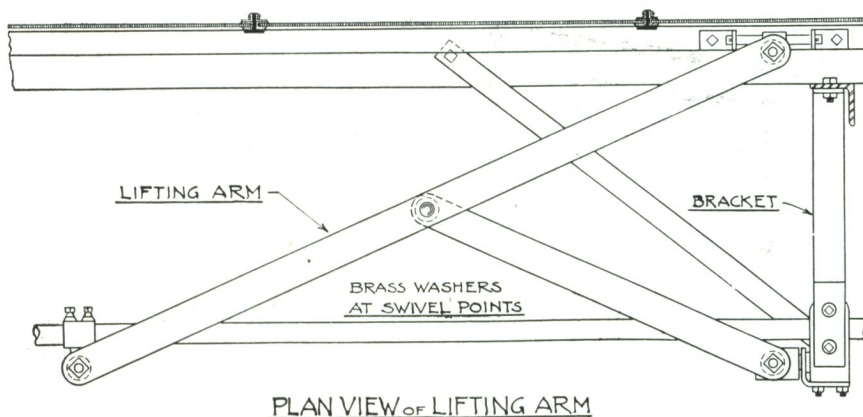
INTERIOR ELEVATION & PLAN VIEW



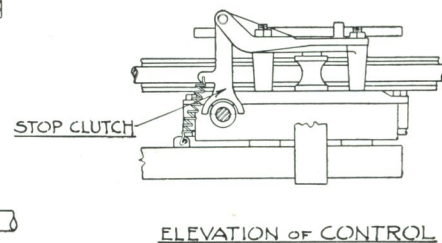
PLAN VIEW OF POWER

VERTICAL SECTION AT POWER

SHAFT BRACKETS



PLAN VIEW OF LIFTING ARM



ELEVATION OF CONTROL

FEDERAL
September 1930

MECHANICAL OPERATORS
Operator C

PLATE No.
D4

(E) ARCHITECTURAL PROJECTED WINDOWS—Specifications

Note: Notes are explanatory or advisory only and should not be included in the specifications.

(E1) Work Included

Note: List and locate all architectural projected windows either in schedules on plans or here to assure accuracy in estimates.

(E2) General

Architectural projected windows shall be Federal electric arc welded windows, manufactured by FEDERAL STEEL SASH COMPANY, Waukesha, Wisconsin, or equivalent, meeting fully this company's standard of quality.

(E3) Shop Drawings

Furnish in (duplicate) (triplicate) for approval of architect, complete shop drawings of all work, showing accurately all details of location, hardware and installation.

(E4) Materials

(E4a) Sections—All sections shall be open hearth solid steel, hot rolled or cold drawn, of special Federal design. Frame and muntin sections shall be 1¼ in. in depth.

(E4b) Vertical Mullions—Vertical mullions shall consist of an exterior plate, two interior angles, cadmium plated U-clips, bolts and pressed steel covers.

(E4c) Horizontal Mullions—Horizontal mullions shall be FEDERAL STEEL SASH COMPANY standard equipped with pressed steel covers.

Note: See Plate A3.

Note: Horizontal mullions should be furnished under Structural Steel Specifications.

(E5) Construction

(E5a) Fabrication—All joints and connections shall be full electric arc welded.

(E5b) Frames—Frame members shall be channel sections, continuous from head to sill and jamb to jamb, mitered at corners and electric arc welded.

(E5c) Muntins—Horizontal muntins shall be continuous from jamb to jamb. Vertical muntins shall be cut to fit horizontal muntins and frames and electric arc welded thereto.

(E5d) Glazing Angles—All lights shall be secured with pressed steel glazing angles neatly mitered at corners and attached with brass screws to window members.

(E5e) Weathering—Ventilators shall have double contact weathering continuous around all four sides.

(E5f) Vertical Mullions—Where two or more windows are placed side by side in the same opening, provide Federal vertical mullions with covers. All mullions shall extend 2 in. into sills for anchorage.

(E5g) Horizontal Mullions—Where two or more windows are placed one above the other in the same opening, provide Federal standard horizontal mullions with covers. In masonry provide at least 4 in. bearing at each end and in structural steel openings arrange for proper attachment.

(E5h) Clips—Furnish all necessary clips and bolts for attaching windows to structural steel.

Note: Include in steel specifications all punching to accommodate clips.

(E5i) Masonry Anchors—Furnish where called for; masonry anchors and bolts for attachment.

(E6) Operation and Hardware

(E6a) Ventilator Operation—Ventilators shall swing out from the sill and down from the head or vice versa, as indicated on the plans.

(E6b) Stay Arms and Friction Guides—Each ventilator shall be provided with two supporting steel arms with ends pivoted on both ventilator and frame.

Friction Guides shall be single point contact with spring actuated bronze swiveling yoke carrying a hardened steel contact ball operating on a steel guide angle.

(E6c) Hardware

Note: Malleable iron hardware is attached at factory. Bronze hardware is shipped separate.

Note: Bronze hardware is standard. Malleable iron hardware may be substituted if desired.

(1) For Swing-out Ventilators—Provide (bronze) (malleable iron) pole ring at head; bronze bracket, and (bronze) (malleable iron) cam handle.

(2) For Swing-in Ventilators—Provide (bronze) (malleable iron) spring latch and keeper at ventilator head.

(E6d) Shade Brackets

Note: All shades must be located at least 2 in. from the inside face of the window to clear hardware. Shades cannot be satisfactorily installed where ventilators project in from the head.

Provide at top of window jamb sections shade bracket clips to receive shade brackets furnished and applied by others after windows have been erected.

Note: Where windows are erected by FEDERAL STEEL SASH COMPANY, it will attach shade bracket clips.

(E7) Painting

(E7a) All windows shall be given one dip-coat of gray mineral paint by the manufacturer before shipment.

Note: Provide for the following in the Painting Specification: One field coat of paint should be applied after erection and before glazing. The application of one or more additional coats should be deferred until at least three weeks after glazing to allow putty to set.

(E7b) After erection and before glazing, all windows shall be given one coat of paint in the field. Paint shall be (specify).

Note: Where windows are erected by FEDERAL STEEL SASH COMPANY, it will do field painting where specified. (See Page 1.)

(E8) Hot Galvanizing or Rust Proofing

Note: See Page 3.

All windows shall be (hot dip galvanized) (cadmium plated) (other rust proof coated) after fabrication.

Note: Do not paint for at least one year.

(E9) Erection

Note: Include in Masonry Specifications that all masonry openings shall be accurately prepared in accordance with Federal installation details. (See Page 4.)

Note: Include in Masonry Specifications that all mortar grouting, mastic, painting, etc., shall be done by the masonry contractor after windows have been erected.

(E9a) All windows shall be erected by FEDERAL STEEL SASH COMPANY in openings prepared by others.

Note: See Page 1.

(E9b) All windows shall be set plumb and true in perfect alignment and securely anchored before glazing.

(E9c) Apply all unattached hardware in accordance with the manufacturer's directions.

(E10) Glass and Glazing

Note: Include the following in the Glazing Specification.

Note: See Page 4.

(E10a) Glass—Glass shall be (¼ in. plate) (specify).

(E10b) Putty—Putty shall be high grade steel window putty.

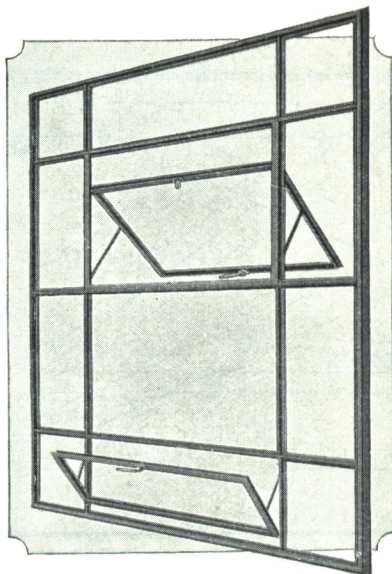
Note: See Page 4.

(E10c) Glazing—All architectural projected windows shall be glazed from the inside. Bed all glass in putty and secure with pressed steel glazing angles furnished by window manufacturer.

Note: Do not paint until putty has set—see (A8).

(E11) Underwriters' Labeled Windows

Note: Architectural projected windows with Underwriters' Laboratories, Inc., label cannot be furnished.

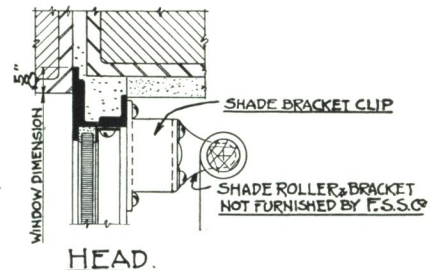
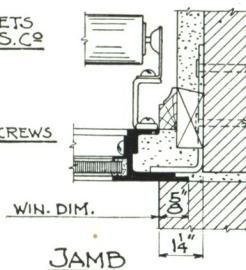
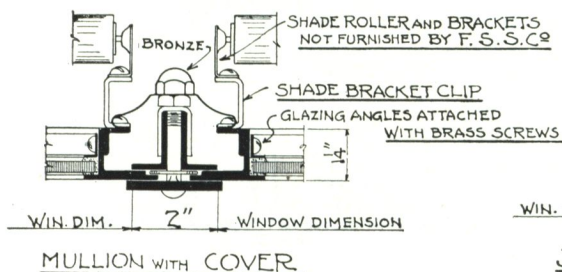


Architectural Projected Window
from the Inside

STANDARD & LISTED SPECIAL

	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"
GLASS SIZES	224 2046	284 2646	344 3046	72-24-72 3646	103-24-103 4046	83-34-83 4646	113-34-113 5046	143-34-143 5646	173-34-173 6046
4'-6"									
5'-0"									
5'-6"									
6'-0"									
6'-6"									
7'-0"									
7'-6"									
8'-0"									
8'-6"									
9'-0"									

③ UNITS MARKED THUS ARE SPECIAL

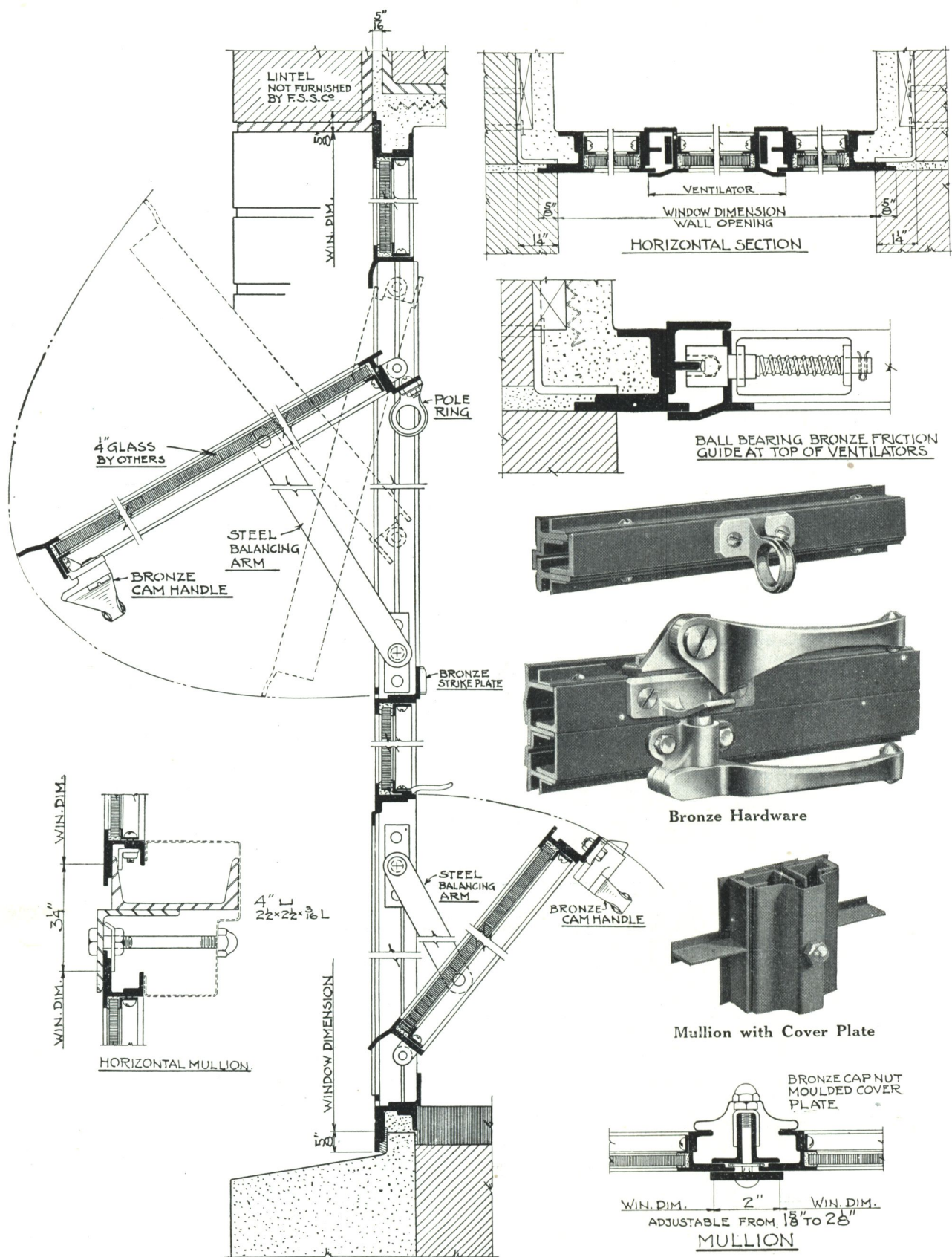


GLASS SIZE IN VENTS:
GLASS SIZE SHOWN ARE FOR FIXED LIGHTS.
DEDUCT 2-INCHES FROM EACH DIMENSION
TO OBTAIN GLASS SIZE FOR VENTILATORS

FEDERAL
September 1930

ARCHITECTURAL PROJECTED WINDOWS
Types and Sizes

PLATE No.
E1



(F) SWING AND SLIDE STEEL DOORS—Specifications

Note: Notes are explanatory or advisory only and should not be included in the specifications.

(F1) Work Included

Note: List and locate all swing and slide steel doors in schedules on plans or here to assure accuracy in estimates. For swing doors indicate whether they open in or out and are right or left hand. For slide doors indicate whether they are right or left hand.

(F2) General

All doors shall be Federal electric arc welded doors manufactured by FEDERAL STEEL SASH COMPANY, Waukesha, Wisconsin, or equivalent, meeting fully this company's standard of quality.

(F3) Shop Drawings

Furnish in (duplicate) (triplicate) for approval of architect, complete shop drawings of all work showing accurately all details of location, hardware and installation.

(F4) Materials

(F4a) Stiles and Rails—Door stiles and rails shall be cold drawn steel tubing, No. 13 gauge for leaves up to 5x10 ft. and No. 11 gauge for leaves 5x10 ft. and over.

(F4b) Glass Panels—Sections for glass panels shall be open hearth solid steel, hot rolled or cold drawn, of special Federal design and shall be 1 1/4 in. in depth.

(F4c) Plate Panels—Plate panels shall be No. 14 gauge steel plate. Provide stiffeners where required.

(F4d) Frames—

Note: Door frames should be included with miscellaneous structural steel, as in all cases, frames should be built in when masonry work of the building is erected. Doors, however, should be installed only after the building has been erected. Provide in structural steel specifications that all frames shall be made to exact dimensions furnished by door manufacturer and shall be erected plumb and true and securely anchored. Provide supports for slide door tracks.

Note: Where particularly desired, 4 in. channel frames for swing doors only will be furnished by door manufacturer. If required, specify below.

Where called for on plans, furnish Federal standard 4 in. steel channel swing door frames complete with angle stops and masonry anchors.

(F5) Construction

(F5a) Stiles and Rails—Stiles and rails shall be mitered at corners. Cross rails shall butt between stiles. All joints and connections shall be full electric arc welded.

(F5b) Glass Panels—All joints and connections in glass panels shall be full electric arc welded. Glass panels shall be constructed to the same standards of material and workmanship as provided in Federal pivoted windows. Glazing angles neatly mitered at corner and attached to panel members with brass screws and bolts shall be provided for all panes.

(F5c) Plate Panels—Plate panels shall be flat and free from buckles, and shall be attached to rails and stiles by electric arc stitch welds.

(F5d) Provision for Hardware—Where required, prepare stiles and rails to receive hardware specified.

Note: Hardware is shipped separate and attached to doors after erection.

(F6) Hardware

(F6a) Swing Door Hinges—Swing leaves shall be mounted on heavy (steel) (bronze) (bronze ball bearings) butt hinges. The number of butts to each leaf shall be sufficient to properly support the weight of the leaf.

(F6b) Swing Door Top and Bottom Bolts—One leaf of each double swing door shall be equipped with Federal standard spring chain operated top and with foot operated bottom bolt.

(F6c) Slide Door Tracks, Hangers, etc.—Slide doors shall be equipped with Federal standard steel tracks, track brackets, roller bearing trucks and adjustable hangers.

(F6c) Locks and Latches—

Note: Select locks and latches desired from list below: If requirements vary on individual doors of same type, list or locate locks and latches for each door.

Note: Master-keyed cylinders will be furnished in standard keying only. Where special systems of master-keying are required, cylinders must be furnished by others.

- (1) Barn door type of latch.
- (2) Cylinder lock for swing door with (iron) (bronze) handle.
- (3) Cylinder for slide doors.
- (4) Combined dead bolt and cylinder lock.
- (5) Antipanic bolts for swing doors.
 - (a) Lever type for single door, inside control, without cylinder lock.
 - (b) Bar type for single door, inside control, without cylinder lock.
 - (c) Bar type for single door, inside and outside control, with cylinder lock.
 - (d) Bar type for double door, inside control, without cylinder lock.
 - (e) Bar type for double door, inside and outside control, with cylinder lock.
- (6) Door checks for swing doors only. (Specify make.)

Note: If hardware other than furnished by FEDERAL STEEL SASH COMPANY is desired, it must be furnished by others to door manufacturer for proper preparation of stiles and rails and must be such as to fit construction of doors.

(F7) Painting

(F7a) All doors shall be given one coat of gray mineral paint by the manufacturer before shipment.

Note: Provide for the following in painting specification: One field coat of paint should be applied after erection but before glazing glass panel. The application of one or more additional coats should be deferred until at least three weeks to allow putty to set.

(F7b) After erection and before setting of glass, all windows shall be given one coat of paint in the field. Paint shall be (specify).

Note: Where doors are erected by FEDERAL STEEL SASH COMPANY, it will do field painting where required. (See Page 1.)

(F8) Erection

(F8a) Doors shall be erected by the manufacturer in openings provided by others.

Note: Where standard channel door frames are furnished by door manufacturer, they shall be set in openings by others.

Note: Door manufacturer shall not be required to do any work in the field to correct inaccuracies or errors in door openings or in frames set by others.

(F8b) Doors shall be erected in a workmanlike manner. Unattached hardware shall be fitted in accordance with manufacturer's directions and doors and hardware left in first class operating condition.

(F9) Glass and Glazing

Note: Include the following in the Glazing Specification:

Note: See Page 4.

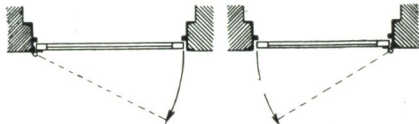
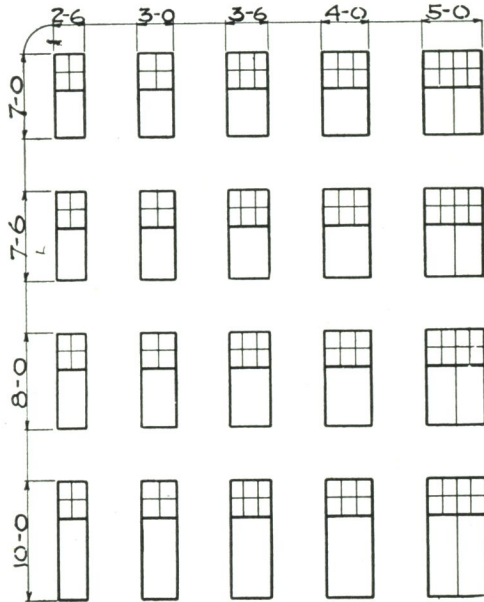
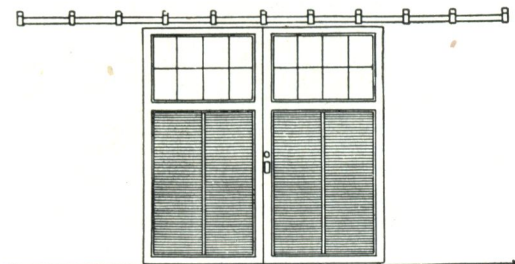
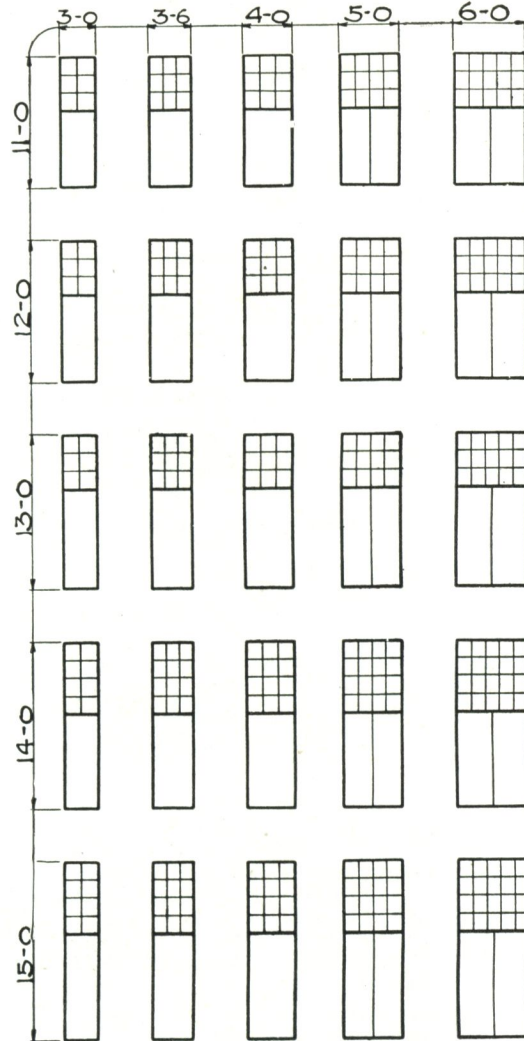
(F9a) Glass—Glass shall be (1/4 in wire glass) (specify).

(F9b) Putty—Putty shall be high grade steel window putty.

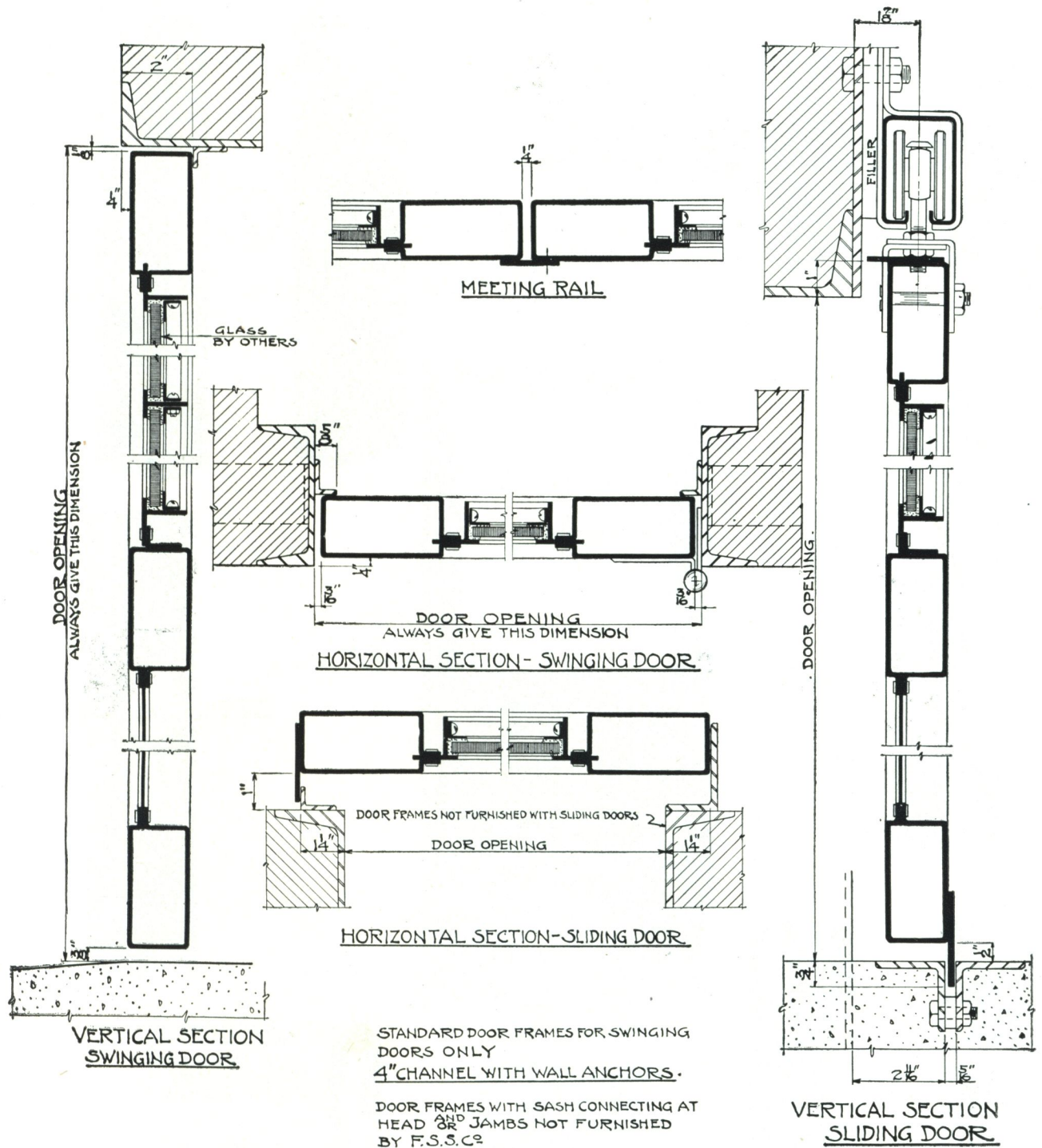
(F9c) Glazing—All glass shall be set in a bed of putty and secured with glazing angles.

(F10) Underwriters' Labeled Doors

Note: Federal swing and slide doors cannot be furnished with Underwriters' Laboratories, Inc., label.

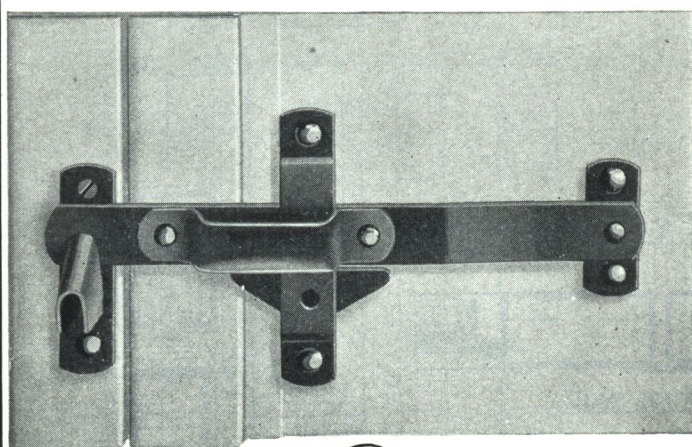
STANDARDLEFT HAND SWING OUTRIGHT HAND SWING OUTLEFT HAND SWING INRIGHT HAND SWING INRIGHT HAND SLIDELEFT HAND SLIDELISTED SPECIALINSIDE ELEVATION DOUBLE SLIDE DOORSNOTE:

DIMENSIONS GIVEN ARE FOR SWING DOORS ONLY.
 DIMENSIONS FOR SLIDE DOORS ARE 3" LESS IN
 WIDTH AND 12" LESS IN HEIGHT THAN DIMENSION GIVEN.
 ALL DIMENSIONS ARE INSIDE MEASUREMENTS OF FRAME.

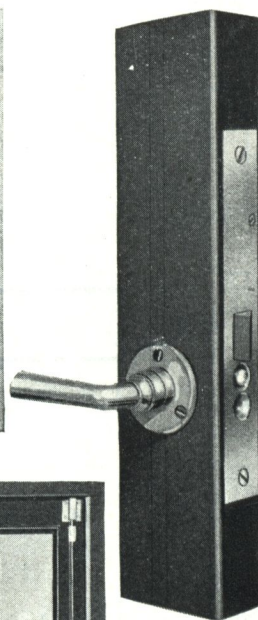


RECOMMENDED DOOR FRAMES

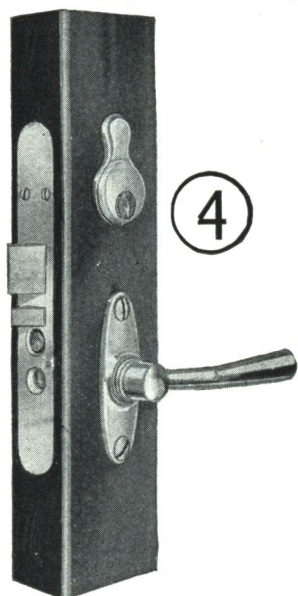
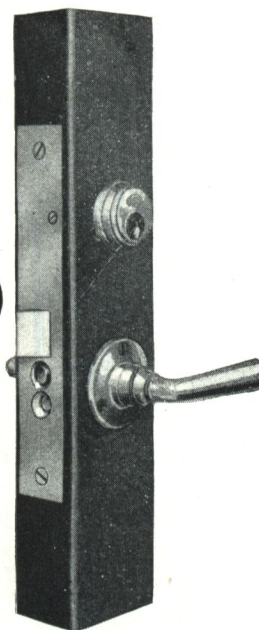
4" CHANNEL	6" CHANNEL	8" CHANNEL
WITH WALL ANCHORS	SINGLE DOOR OPENINGS	SINGLE DOOR OPENINGS
DOOR OPENINGS	UP TO 4'-0" x 10'-0"	UP TO 5'-0" x 12'-0"
UP TO 3'-6" x 8'-0"	OR 5'-0" x 8'-0"	OR 6'-0" x 10'-0"
OR 4'-0" x 7'-6"	DOUBLE DOOR OPENINGS	DOUBLE DOOR OPENINGS
	UP TO 7'-0" x 10'-0"	UP TO 10'-0" x 12'-0"



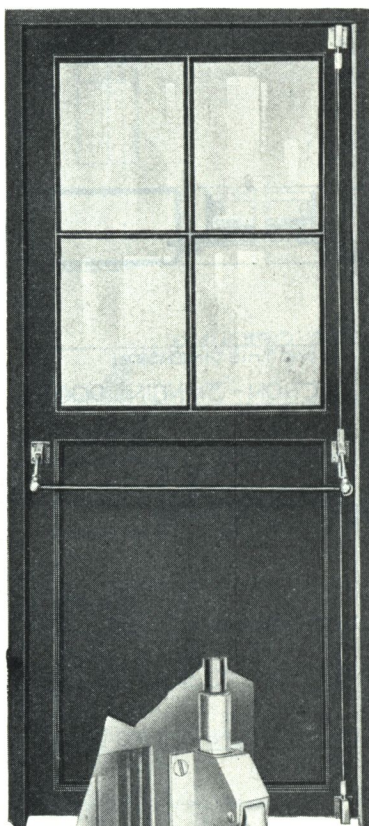
①



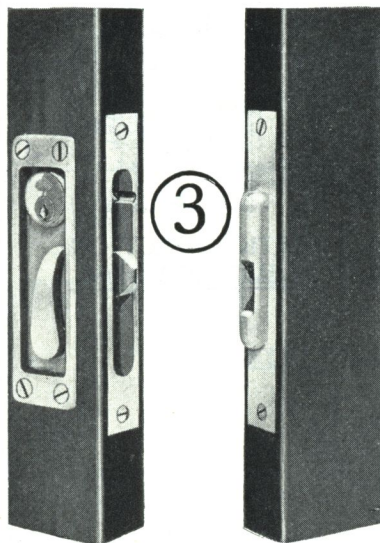
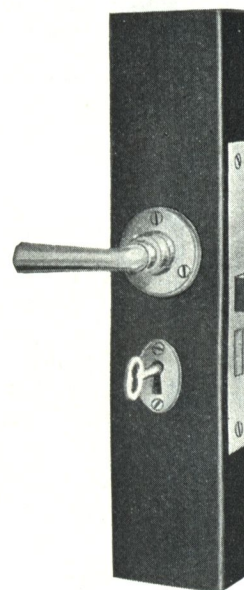
②



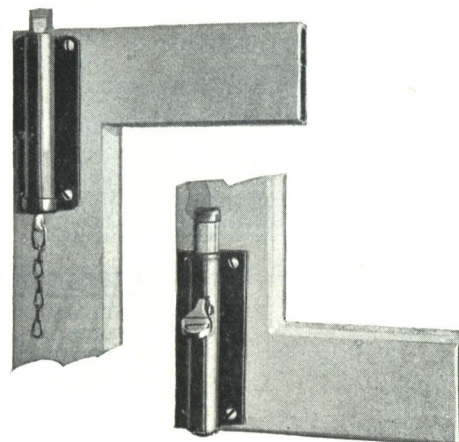
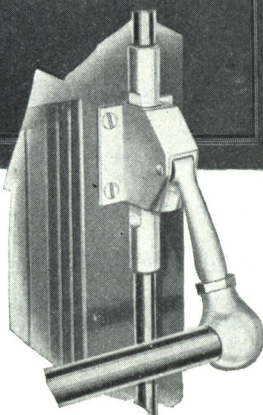
④



⑤



③



FEDERAL
September 1930

INDUSTRIAL DOORS
Hardware

PLATE No.
F3

(FA) AIRPLANE HANGAR DOORS—Specifications

Note: Notes are explanatory or advisory only and should not be included in the specifications.

(FA1) Work Included

Note: Locate all hangar doors on plans and indicate clearly whether straight slide or round corner type, and if sliding in two directions the point at which the door breaks. Give clear opening dimensions—both width and height.

(FA2) General

Airplane hangar doors shall be Federal electric arc welded doors as manufactured by FEDERAL STEEL SASH COMPANY, Waukesha, Wisconsin, or equivalent, meeting fully this company's standard of quality.

(FA3) Shop Drawings

Furnish in (duplicate) (triplicate) for approval of architect, complete shop drawings of all work, showing accurately all details of location, hardware and installation.

(FA4) Materials

Note: Guide angles at the top of doors, track rails for trucks and door frames are not furnished by door manufacturer.

(FA4a) Sections—All sections shall be open hearth solid steel, hot rolled or cold drawn, of special Federal design.

(FA4b) Stiles and Rails—Door stiles and rails shall be (steel tubing) (4-in structural channels).

(FA4c) Glass Panels—Sections for glass panels shall be open hearth solid steel, hot rolled or cold drawn, of special Federal design and shall be 1¼ in. in depth.

(FA4d) Plate Panels—Plate panels shall be steel plate. Provide stiffeners where required.

(FA4e) Frames

Note: Door frames are not furnished by door manufacturer and should be included in Structural Steel Specifications.

(FA4f) Hardware—Hardware shall be Allith-Prouty standard airplane hangar door hardware.

(FA5) Construction

(FA5a) Stiles and Rails—Stiles and rails shall be mitered at corners. Cross rails shall butt between stiles. All joints and connections shall be full electric arc welded.

(FA5b) Glass Panels—Horizontal muntins shall be continuous from jamb to jamb. All joints shall be electric arc welded. Glass panels shall be equipped with glazing angles neatly mitered at corners and attached to panel sections with brass screws and bolts.

(FA5c) Plate Panels—Plate panels shall fit between stiles and rails shall be electric arc welded thereto.

(FA5d) Hardware—Doors shall be prepared to receive hardware which shall be installed and attached at time of erection.

(FA6) Hardware

(FA6a) Doors shall be equipped with Allith-Prouty standard airplane hangar door hardware complete, including trucks, cane bolts, cremone bolts and hinges (on swing doors only), provision for attaching of which shall be made by the door manufacturer before shipment from factory.

(FA6b) Pilot Door Hardware—Pilot door hardware shall include hinges and locks and shall be fitted to the doors by the door manufacturer before shipment from the factory, but shall be shipped separate.

(FA6c) Pilot door locks shall be (specify). (See F6c Page 26.)

(FA7) Painting

(FA7a) All doors shall be given one coat of gray mineral paint by door manufacturer before shipment.

Note: Provide for the following in the Painting Specifications: One field coat of paint should be applied after erection but before glazing of glass panels. The application of one or more additional coats should be deferred until at least three weeks after glass has been set in glass panels to allow putty to set.

(FA7b) After erection all doors should be given one coat of paint in the field by the door manufacturer. Paint shall be (specify).

Note: Where doors are erected by FEDERAL STEEL SASH COMPANY, it will do field painting where specified. (See Page 1.)

(FA8) Erection

(FA8a) All doors shall be erected by the door manufacturer.

Note: See Page 1.

(FA8b) Doors shall be erected in a workmanlike manner. All unattached hardware shall be installed in accordance with the manufacturer's direction and doors and hardware left in first class condition.

(FA9) Glass and Glazing

Note: Include the following in Glazing Specifications:

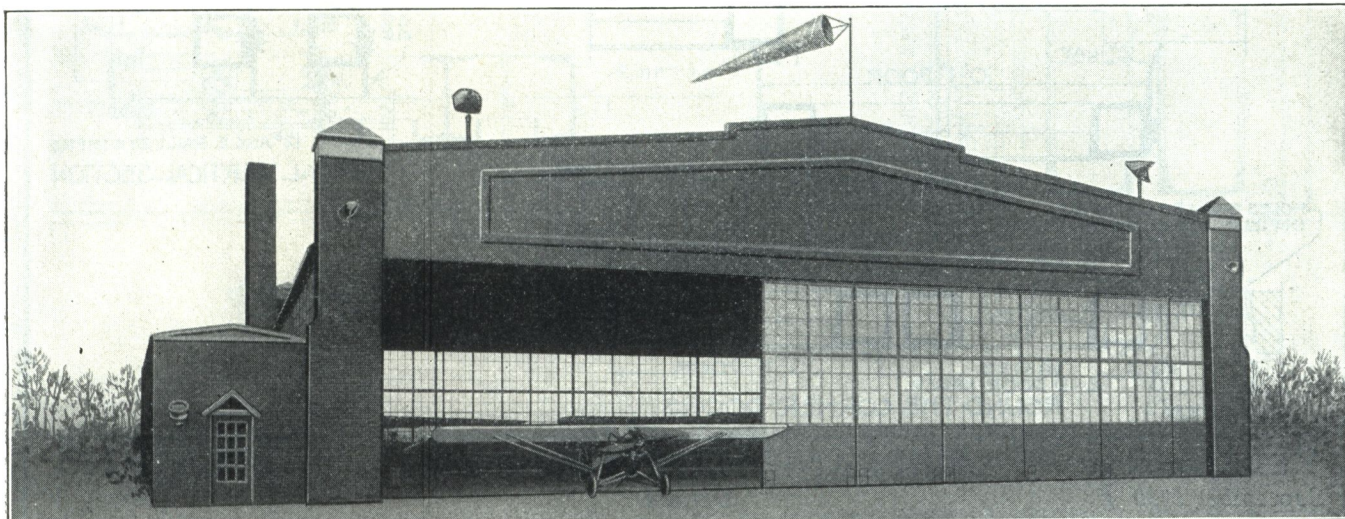
Note: See Page 4.

(FA9a) Glass shall be (specify).

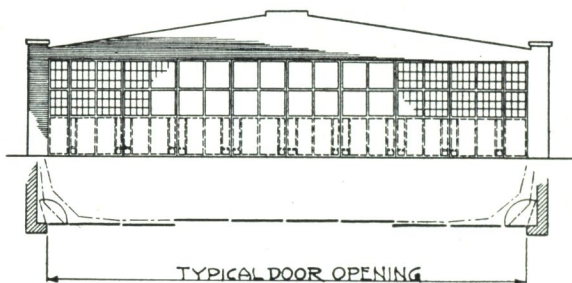
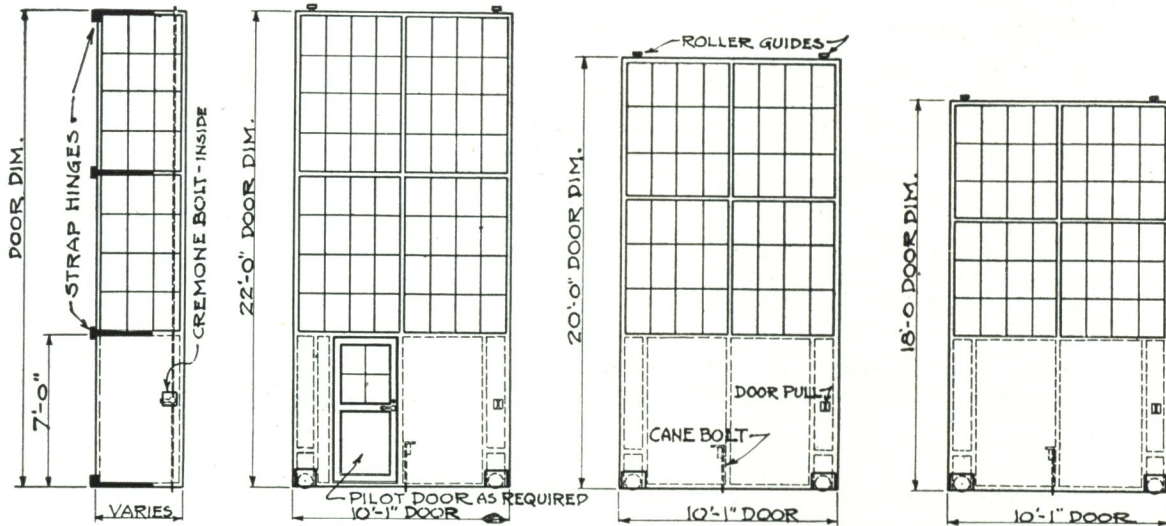
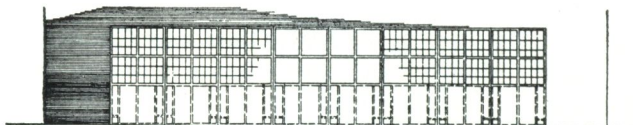
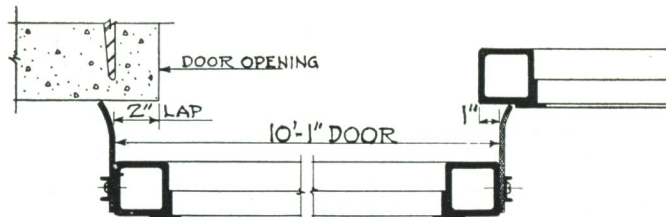
(FA9b) Putty—Putty shall be high grade steel window putty.

Note: See Page 4.

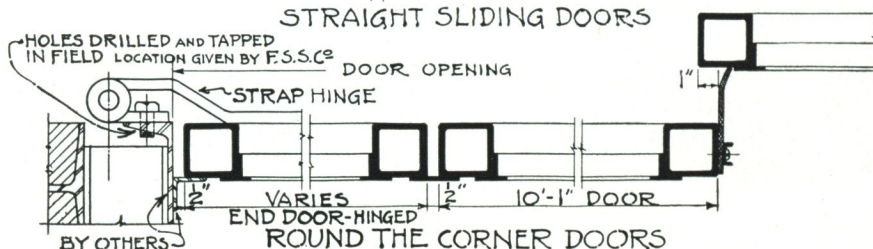
(FA9c) Glazing—All glass shall be set in a bed of putty and secured with glazing angles.



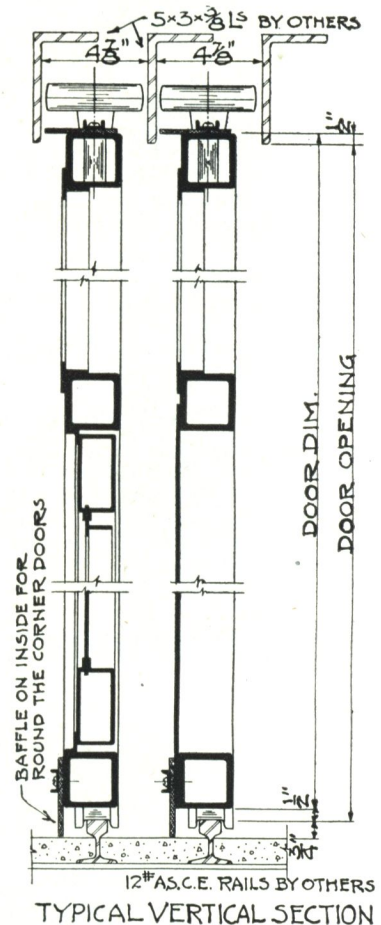
STANDARD DOOR SIZES

TYPICAL DOOR OPENING
ROUND THE CORNER DOORSTYPICAL DOOR OPENING
STRAIGHT SLIDING DOORS

STRAIGHT SLIDING DOORS

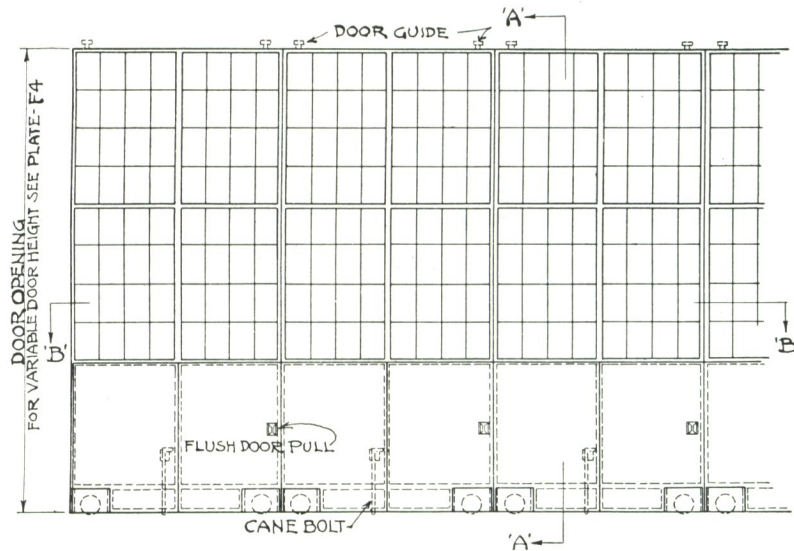


ROUND THE CORNER DOORS



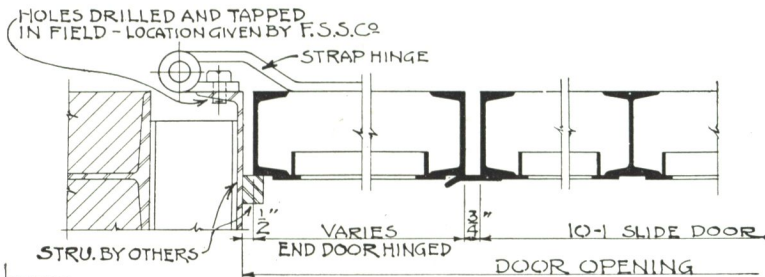
TYPICAL VERTICAL SECTION

FEDERAL.
September 1930AIRPLANE HANGAR DOORS
DetailsPLATE No.
F4

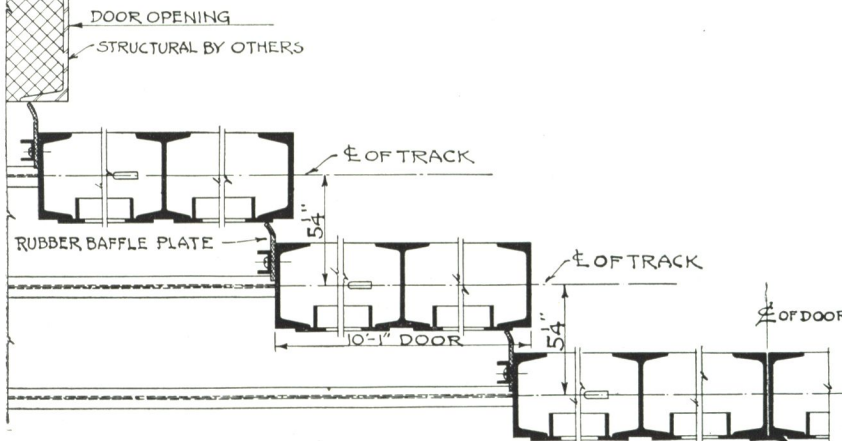


TYPICAL ELEVATION FOR STRAIGHT SLIDING DOORS

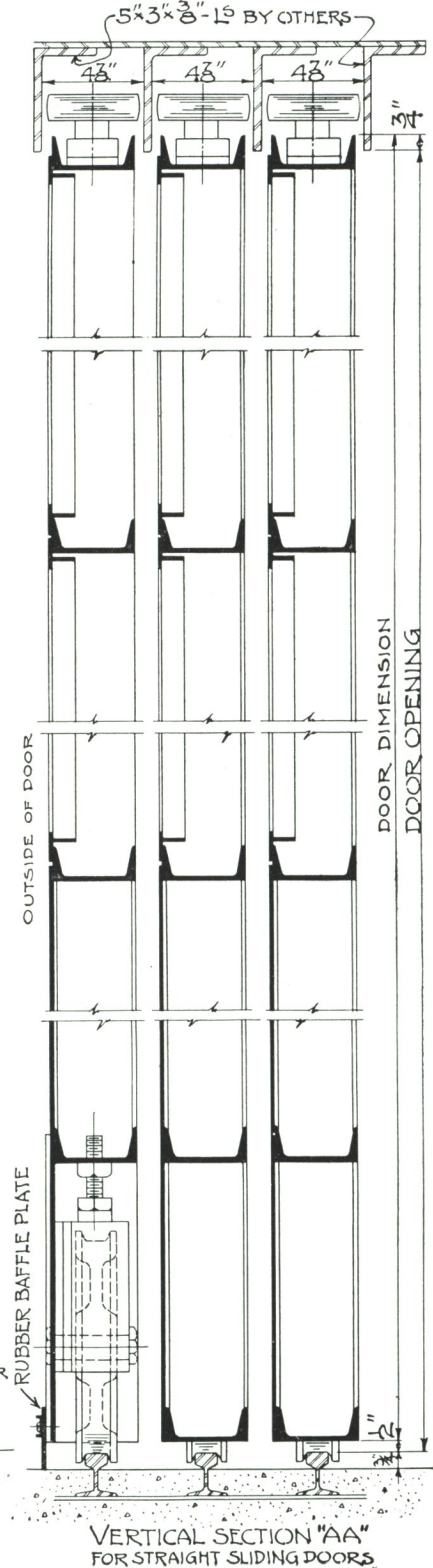
NOTE: FOR PILOT DOORS SEE PLATE-F4 FOR GENERAL ARRANGEMENT



ROUND THE CORNER DOORS



HORIZONTAL SECTION "BB"
— FOR STRAIGHT SLIDING DOORS



VERTICAL SECTION "AA"
FOR STRAIGHT SLIDING DOORS

FEDERAL
September 1930

AIRPLANE HANGAR DOORS
Details

PLATE No.
F5



WELDED
Solid Steel

FEDERAL STEEL
Waukesha

Digitized by:



ASSOCIATION
FOR
PRESERVATION
TECHNOLOGY,
INTERNATIONAL
www.apti.org

BUILDING
TECHNOLOGY
HERITAGE
LIBRARY

<https://archive.org/details/buildingtechnologyheritagelibrary>

From the collection of:
Robert Vail Cole Jr, AIA
1962 – 2011



WELDED
Solid Steel Windows

FEDERAL STEEL SASH COMPANY

Waukesha, Wisconsin